HALO HVAC

AHU Condition Report

Spire Montefiore

Reference: Q1657/17.07.2024

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Spire Montefiore

Air Handling Unit 8 - Condition Report

Report approved by

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Reference: Q1657/ACVR Services Ltd/17.07.2024

Executive Summary

Client: Spire Montefiore

Location: Spire Montefiore, 2 Montefiore Rd, Brighton and Hove, Hove BN3 1RD

Date Surveyed: 12/07/2024.

Spire Healthcare

About:

Spire Montefiore Hospital in Brighton is a private healthcare facility that opened in 2012. It is part of the Spire Healthcare group, which operates a network of private hospitals across the UK. The hospital is located in the Hove area and offers a wide range of medical services, including outpatient consultations, diagnostic imaging, and inpatient care.

The hospital is equipped with modern medical facilities, including operating theatres, a physiotherapy suite, diagnostic imaging services (such as MRI, CT scans, and X-ray), and private en-suite patient rooms to ensure comfort and privacy.

The hospital provides services across various medical specialties, including orthopaedics, cardiology, oncology, gynaecology, general surgery, and cosmetic surgery.

The hospital employs a team of highly experienced consultants and medical professionals, ensuring patients receive high-quality care and treatment.

While specific patient numbers can vary, Spire Montefiore Hospital serves thousands of patients annually, providing both inpatient and outpatient services. The hospital's capacity includes several beds for inpatient care and a significant number of outpatient appointments.

Spire Montefiore Hospital is known for its commitment to providing high standards of clinical care and patient satisfaction, making it a leading choice for private healthcare in the Brighton and Hove area.

The HALO AHU condition report key

The HALO AHU condition report key is accurate and consistent, it refers to an industry consensus view of 'common classifications' for building engineering services, bringing together the Chartered Institution of Building Services Engineers (**CIBSE**), the Royal Institution of Chartered Surveyors (**RICS**), the Building Engineering Services Association (**BESA**) and the Government Functional Standard for Property **(GOV.UK).**

- CIBSE Guide M, Appendix 12.A1: indicative economic life expectancy
- CIBSE Guide M 13, Engineering condition surveys
- BESA SFG20 task schedules
- RICS NRM 3: asset description
- Facilities Management Standard 002: Asset Data

Each AHU is given a condition rating of GREEN, AMBER, or RED to provide a clear overview.

- Fully functioning at the time of survey.
- Components operating correctly and in good condition, identified ongoing maintenance.
- All the components within the AHU are still within their life expectancy according to CIBSE guide M Appendix 12.A1: Indicative economic life expectancy.

- Functioning at time of survey, however condition indicates that remedial works are required.
- Additional maintenance required.
- Some components are approaching the end of their life expectancy according to CIBSE guide M Appendix 12.A1: Indicative economic life expectancy.

- Unit not functioning or operational at time of survey.
- Faulty or damaged components that require replacement.
- Standard maintenance not enough to bring unit to workable condition.
- The components have exceeded their life expectancy according to CIBSE guide M Appendix 12.A1: Indicative economic life expectancy.

HALO AHU condition reports are warrantable for the use of clients, facilities managers, contractors, and consultants to provide the structured asset information needed for the implementation of building information management, and to validate a clear capital-allocation or improvement strategy during the operational phase of asset life.

Compendium:

HALO HVAC recently undertook a comprehensive inspection at Spire Montefiore, on July 12th, 2024. Our engineer conducted a thorough assessment of Air Handling Unit 8 (AHU 8) to provide a detailed report with actionable recommendations aimed at bolstering the overall reliability of the system, improving efficiency, extending the life cycle of the AHU, and improving compliance with current HTM 03-01 guidance.

Throughout our meticulous survey, our team diligently examined each component of the AHU. This included a thorough inspection of the filters, fans, coils, dampers, and overall structural integrity of the AHU casework.

Regrettably, we were unable to perform any pitot traverse readings within the supply and extract ductwork due to the absence of test holes in the rooftop ductwork. Discussions with the onsite engineering team revealed that there are no test holes in any of the ductwork across the site. This lack of test holes raises concerns about the commissioning and validation processes of the AHUs when they were originally installed. Without these critical test points, it is challenging to accurately assess the system's performance and ensure it meets necessary standards.

The resulting report presents a comprehensive breakdown of its condition, augmented by illustrative photographs and an exhaustive list outlining recommended remedial actions. Moreover, the report addresses compliance issues with HTM 03-01, offering guidance on how to improve compliance with these standards.

Our subsequent report not only delivers a detailed analysis of current conditions but also provides strategic recommendations for any necessary corrective measures. By ensuring optimal functionality and reliability, these recommendations aim to enhance the longevity and efficiency of the AHU system.

Air Handling Unit conditions;
AHU 8 Diagnostic

Project Reference:	Spire Montefiore	AHU Reference:	AHU 8 Diagnostic
Date of Survey:	12/7/24	Condition:	

AHU 8 Diagnostic

To facilitate safe access for our engineer, the AHU was temporarily deactivated via the local isolators installed on the AHU casework. The AHU was manufactured by ECE in 2011 and was originally designed to achieve 0.64m³/s @ 275Pa ext on the supply and 0.64m³/s @ 275Pa ext on the extract. During our survey it was observed that the supply fan inverter was operating at 50Hz. The extract fan inverter was in fault indicating an issue with motor over temperature.

The fresh air inlet for the AHU is an external weather louvre with bird mesh affixed to the rear. The louvre seemed in reasonable condition with a clean required on the external face and clean of the bird mesh. A fresh air inlet damper is installed immediately behind the intake louvre. The damper utilises plastic cogs and also has the damper actuator within the airstream.

An attenuator is installed after the fresh air inlet damper and has suffered from corrosion over the years. Upon removal of the access panel for the attenuator, it was excessively dirty which is impacting performance.

The bare tube frost coil is in reasonable condition and has a stainless-steel casework construction designed to heat from -4°C to 5°C using 80°C/60°C flow and return temperatures. There is a build-up of dirt within the section after the frost coil immediately before the panel filters.

The panel filter frame is a side withdrawal type manufactured from stainless steel. This houses 2no 47mm deep ISO16890 Coarse 80% panel filters. It is not possible to retrofit a front withdrawal filter frame in place of the existing side withdrawal frame due to the access constraints of the existing AHU. The way the existing filter frame is manufactured with a supporting bracket that requires removal to replace the filters ensures that the filters cannot be drawn through the unit.

The AHU contains a plate heat exchanger as means of heat recovery which had a dry efficiency of 47.3% at design stage, over the years this efficiency level will have decreased due to dirt build up within the matrix of the plate heat exchanger. Current ErP regulations require a 73% efficient heat recovery device in supply and extract air handling units. The plate heat exchanger is corrosion protected to suit the coastal environment of the site. The face and bypass damper for the plate heat exchanger uses plastic cogs and also has the damper actuator within the airstream.

Immediately after the plate heat exchanger is a SISW belt driven fan with run and standby motors installed out of the air stream. Both motors were belted up to the fan pulley and inverters are installed within the fan section with keypads installed on the AHU casework secured in weatherproof housings. The drive guard for the supply fan was missing during our survey. We recommend the SISW belt driven fan and motors are upgraded to run and standby energy efficient direct drive EC plug fans. A critical spare EC plug fan should be supplied in the unlikely event of failure.

There is an access section between the fan outlet and the face of the cooling coil. The cooling coil is in reasonable condition and was designed to cool from 30°C to 13°C using 7°C/12°C flow and return temperatures and was manufactured with polyester coated aluminium fins and stainless-steel casework. The original design drawing for the AHU states the coil is fitted with a removable stainless-steel drain tray and removable moisture eliminators. However, upon inspection it appears the eliminators do not seem to be the removable type.

A further access section separates the cooling coil from the main heating coil of the AHU. The main heating coil is in reasonable condition and was designed to heat from 5°C to 30°C using 80°C/60°C flow and return temperatures and was manufactured with polyester coated aluminium fins and stainless-steel casework.

The bag filters are the last component within the AHU on the supply air side. The bag filter frame is a side withdrawal type manufactured from stainless steel. This houses 2no 380mm deep ISO16890 ePM2.5 65% bag filters. It is not possible to retrofit a front withdrawal filter frame in place of the existing side withdrawal frame due to the access constraints of the existing AHU. The way the existing filter frame is manufactured with a supporting bracket that requires removal to replace the filters ensures that the filters cannot be drawn through the unit.

The first component on the return air inlet side of the AHU is a set of ISO Coarse 80% panel filters. Whilst it is possible to retrofit a front withdrawal filter frame for this set of filters, the width of the unit and access limitations will inhibit replacing the filters effectively as there will be a requirement for P clips to secure the filters into position on the far non access side of the AHU. It would not be possible for a maintenance engineer to replace the filters and ensure the P clip securely holds the filters in place preventing air bypass. The way the existing filter frame is manufactured with a supporting bracket that requires removal to replace the filters ensures that the filters cannot be drawn through the unit.

The belt driven extract fan is a DIDW type fan with run and standby motors in the air stream. The standby motor was not belted up to the fan pulley, therefore, if the existing motor was to fail there would be no extract airflow. During our survey, the inverter keypad stated Fault 9 which indicates motor overtemperature. We recommend the DIDW belt driven fan and motors are upgraded to run and standby energy efficient direct drive EC plug fans. A critical spare EC plug fan should be supplied in the unlikely event of failure.

There is a large plenum section behind the recessed control panel of the AHU before leading onto the plate heat exchanger. The drain tray for the plate heat exchanger is not removable, however, there is good access to clean the drain tray as part of a regular maintenance regime.

There is an inbuilt attenuator installed after the plate heat exchanger in the extract air stream. It is in better condition than the supply attenuator.

An exhaust damper is installed after the attenuator. The damper utilises plastic cogs and has the damper actuator within the airstream. There is some corrosion within the exhaust section between the exhaust damper and exhaust cowl.

The distance between the exhaust cowl and the fresh air intake is minimal and could cause recirculation should prevailing winds direct exhaust air back into the fresh air intake, potentially compromising air quality and system efficiency.

It was noted during our survey that the bulkhead lights were not operational throughout the AHU. The port holes on the AHU have blown and no longer fit for purpose. A total of four hinged access doors on the AHU contained no port holes to view the internal components. The clamped access doors on the AHU also contain no port holes. The terminal box on the external AHU casework that houses the cable entry for controls cabling is completely corroded and requires replacement. The isolators for the motors show signs of degradation.

As part of our condition survey, we have investigated the feasibility of increasing the design air volume of the air handling units. HTM 03-01 has requirement of a maximum velocity of 2m/s across the internal components. The plate heat exchanger already exceeds the maximum velocity as per HTM 03-01 requirements. However, if a derogation can be made, the maximum air volume is dictated by the velocity across the cooling coil. The maximum air volume possible from the AHU which provides a 2m/s velocity across the cooling coil is 0.74m³/s which is an approximate 15% increase.

We've formulated the below table to indicate the current velocities over the components based on the design air volume and potential new air volume.

Component	Current velocity based on design air volume 0.64m³/s	New velocity based on potential new air volume 0.74m³/s
Frost coil	1.48 m/s	1.71 m/s
Supply air panel filters	1.22 m/s	1.4 m/s
Plate heat exchanger	2.581 m/s	2.99 m/s
Cooling coil	1.73 m/s	1.99 m/s
Main heating coil	1.48 m/s	1.71 m/s
Bag filters	1.21 m/s	1.4 m/s
Return air panel filters	1.22 m/s	1.4 m/s

AHU Photos:

AHU 8 Diagnostic

Overview of AHU 8 Diagnostic

Fresh air inlet louvre

Fresh air inlet damper and actuator

Corrosion in fresh air intake section

Air on side of attenuator in supply air stream

Attenuator in supply air stream

Air off side of attenuator in supply air stream

Plenum between attenuator and frost coil

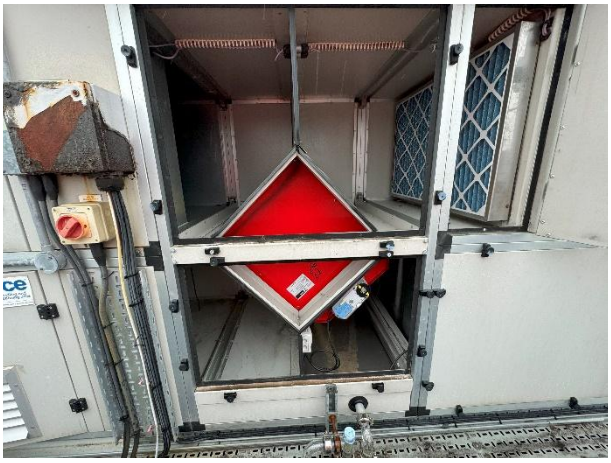
Frost coil

Plenum between frost coil and panel filters

Air on side of panel filters

Air off side of panel filters

Air on side of plate heat exchanger supply air stream



Overview of plate heat exchanger

Air off side of plate heat exchanger supply air stream

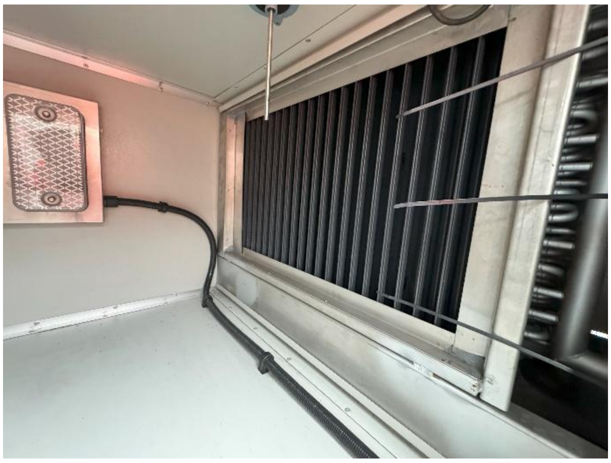
Divider within fan section to separate motors from air stream

Belt driven SISW supply fan with run and standby motors

Supply fan outlet

Air on side of the cooling coil

Glass trap for cooling coil



Moisture eliminators

Main heating coil

Bag filters

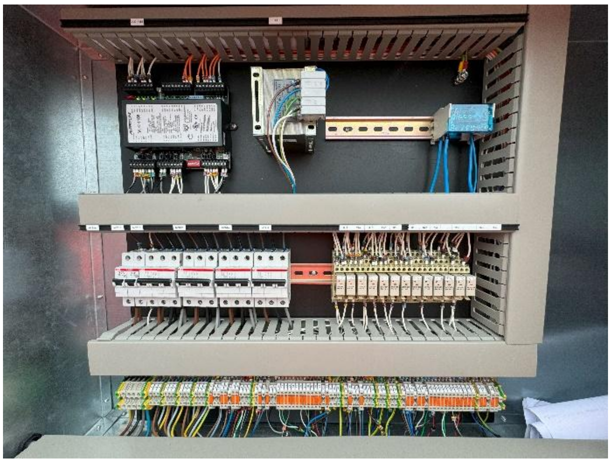
Return air panel filters

Belt driven extract fan with run and standby motors

Belt driven extract fan with run and standby motors

Plenum between extract fan outlet and plate heat exchanger

Terminal box



Recessed control panel

Air on side of plate heat exchanger in extract air stream

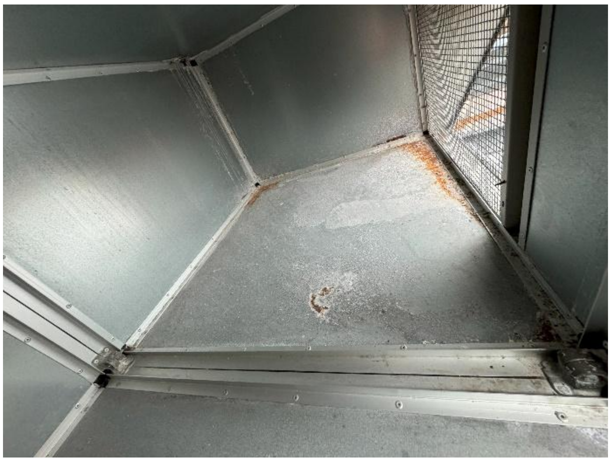
Air off side of plate heat exchanger in extract air stream face and bypass damper

Glass trap for plate heat exchanger

Air on side of attenuator in extract air stream

Air off side of attenuator in extract air stream

Exhaust damper



Exhaust section with signs of corrosion

Exhaust cowl

Isolators

Kinked tubing for manometer

Isolators

Missing inverter keypad

AHU Condition report recommendations:

- Clean the fresh air inlet louvre and associated bird mesh.
- Replace the fresh air inlet damper and exhaust damper with new metal linkage dampers.
- New damper actuators to be out of air stream.
- Supply and install new supply air damper and return air dampers.
- Replace the corroded supply air stream attenuator and extract air stream attenuator.
- Retrofit handles onto the removable access panels for the attenuators.
- Replace the frost coil to suit the new air volume.
- Replace the panel and bag filters throughout the AHU.
- Replace the plate heat exchanger and associated face and bypass damper. The new PHE will be epoxy coated with a metal linkage face and bypass damper.
- Upgrade the supply and extract belt driven fans to energy efficient direct drive EC plug fans.
- New EC plug fans to come with commando sockets and critical spares.
- Plate over the redundant inverter keypads.
- Modify the control panel to suit the new EC plug fans.
- Replace the cooling coil to suit the new air volume. New cooling coil to come with removable eliminators.
- Replace the main heating coil to suit the new air volume.
- Remove exhaust cowl and install 90-degree duct and new exhaust cowl to reduce risk of air recirculation.
- Clean the internal surfaces of the unit throughout.
- Sand and treat the corroded surfaces of the unit throughout.
- Replace the corroded terminal box.
- Replace the isolators.
- Supply and install four new hinged access doors c/w portholes to replace the existing access doors without.
- Replace the hinged access doors that currently have portholes with new access doors c/w portholes.
- Supply and install three new clamped access doors c/w portholes to replace the existing clamped access doors without.
- The lighting throughout the unit was not operational and was wired to multiple switches.

Conclusion

- Functioning at time of survey, however condition indicates that remedial works are required.
- Additional maintenance required.
- Some components are approaching the end of their life expectancy according to CIBSE guide M Appendix 12.A1: Indicative economic life expectancy.

There are several recommendations to address the issues identified within AHU 8 surveyed. Some of the items to address are due to the condition of the existing components, and some items are to bring the unit closer to compliance with HTM 03-01 regulations. If the decision is made to increase the air volume for the AHU, then consideration should be given to replace the coils within the units to ensure the heating and cooling capacities are not negatively affected. It has been noted that the heating and cooling coils have been designed without any consideration of the air off conditions from the plate heat exchanger.

The fresh air inlet louvre and bird mesh should be cleaned. The panel and bag filters throughout the unit should be replaced as part of any refurbishment works. The internal surfaces of the unit should be cleaned with any corrosion sanded down and treated. The attenuator within the supply air stream should be replaced. The corroded terminal box should be replaced along with the isolators mounted on the external casework of the AHU. If the existing fans and motors are to remain, a new keypad should be installed for one of the extract inverters. The standby motor should also be belted up to the fan pulley to ensure auto changeover between the run and standby motors.

In terms of HTM 03-01 compliance, it is not possible to bring the existing AHU fully compliant with HTM 03-01 due to several reasons including casework limitations, access requirements, and construction. There are numerous items that can be addressed to bring the unit closer to compliance.

The fresh air inlet, exhaust, and face and bypass damper currently utilise plastic cogs. They should therefore be replaced with new dampers utilising metal linkages to operate. New damper actuators should be installed out of air stream. There are no supply air dampers or return air dampers fitted. It is not possible to replace the face and bypass damper on the plate heat exchanger without replacing the plate heat exchanger itself. The drain tray for the plate heat exchanger is not removable, however, there is plenty of access to maintain the drain tray even with the exhaust attenuator in proximity.

The existing CHW cooling coil has fixed moisture eliminators with no access for cleaning therefore the coil should be replaced. The new coil should have a removable stainless-steel drain tray and removable moisture eliminators.

There are numerous access doors throughout the AHU that do not contain any port holes. New access doors should be installed with port holes. Any doors with existing port holes should also be replaced in their entirety as it is a more economical solution than replacing individual port holes. Any lift off doors should be fitted with handles for ease of removal.

The exhaust cowl is within 1m of the fresh air inlet louvre therefore should be removed. A new 90-degree section of ductwork should be installed facing away from the fresh air inlet louvre connected to a new exhaust cowl to mitigate the risk of cross contamination of airflows.

Upgrading the existing belt driven fans and motors to energy efficient direct drive EC plug fans will not only bring the AHUs closer to compliance with HTM 03-01 as they are the preferred fans for healthcare AHUs, but the new EC plug fans can be selected to achieve a higher design air volume and provide better control. EC plug fans offer significant benefits in terms of system reliability, efficiency, and reduced maintenance requirements. The new EC plug fans will be installed with commando sockets to allow quick replacements to be completed in the unlikely event of failure. Critical spare EC plug fans should be supplied with fitted commando sockets ready to be installed.

The following statements have been extracted from HTM 03-01 Part A and Part B:

Fans represent an enormous potential for energy savings to reduce carbon emissions, as they are among the largest single users of energy (they use approximately 40% of all electricity in ventilation systems). The European Regulation 1253/2014, implementing the Energy-related Products (ErP) directive, has significantly reduced the power to drive fans. Accordingly, Health Technical memorandum 03-01 recommends using electronically commutated fans, as these have been proven to be the most energy-efficient, while also advising that belt-driven fans should no longer be installed.

1.53 In order to maintain efficiency, ventilation systems should be refurbished at their mid-life point (typically 10 years after original installation). The complete system should be taken out of use and thoroughly inspected. The AHU and its distribution ductwork should be cleaned as appropriate, any internal corrosion investigated and treated, the complete control system upgraded and the entire installation rebalanced and recommissioned. The performance of the system should be validated (see Chapter 12 in Part A of this Health Technical Memorandum) before being returned to service.

Note: During this process the opportunity should be taken to replace any belt driven fans with the most energy efficient fans available, for example electronically commutated (EC) plug fans or direct-drive plug fans. (Chapter 9 in Part A of this Health Technical Memorandum gives details of fan types and preferred selection and installation strategies.)

4.75 If the ventilation load is to be increased or reduced and the existing system is retained, its output should be adjusted to suit. This will necessitate a recalculation of the heater and cooler loads and resizing of the control valves to match the new loads. It may also necessitate a change in fan size. Failure to carry out this exercise will carry an energy penalty and loss of control function.

9.18 Plastic-bladed dampers and plastic plate heat exchangers should not be fitted. This accords with the national policy to reduce the use of plastics.

9.19 Motorised spring-return low-leakage (BS EN 1751 class 3) isolation dampers should be located at the intake, supply, return air and discharge duct connections of an AHU and associated extract unit. They should be of the opposed-blade type and be fitted with end switches. They should close automatically in the event of power failure or plant shutdown to prevent any reversal of the system airflow. They will also function to isolate the plant from the distribution system when undertaking cleaning or maintenance.

9.22 Internal illumination should be provided by fittings to at least IP55 rating. Light fittings should be positioned inside the unit (not on the access doors) so that they provide illumination for both inspection and task lighting. All lights in a unit should be operated by a single switch and be powered independently of the AHU main switch. LED lights are preferred.

9.31 Intakes and discharges should be designed and located so that wind speed and direction have a minimal effect on the plant throughput.

9.35 The discharge from an extract system will be located so that vitiated air cannot be drawn back into the supply air intake or any other fresh air inlet. Ideally, the extract discharge will be located on a different face of the building from the supply intake(s). At all times, there has to be a minimum separation of 4 m between them, with the discharge mounted at a higher level than the intake.

9.40 Direct-drive electronically commutated (EC) fans are the preferred choice for ventilation systems. If necessary, resilience and an increased capacity can be achieved by installing two or more EC fans with gravity or motorised dampers to prevent backflow.

9.45 Belt- and pulley-driven fans should not be installed in healthcare ventilation systems.

9.68 If a plate heat exchanger is chosen, the plates should be constructed of metal; in coastal areas stainless steel is preferred. Plastic should not be used for the plates, internal bypass dampers or gears. (This is in keeping with the reduction in the use of single use plastics.)

9.88 In an AHU when the cooling-coil face velocity is greater than 2 m/s a drift eliminator will be required downstream of the coil. The eliminator will be an entirely separate device mounted on slide rails so that it can be easily removed without the need for tools. If the size of the AHUs precludes the use of slide rails, and the eliminator is constructed in sections which maintenance personnel will have to enter the unit to remove, each section should have lifting handles. In order to reduce the use of plastics, alternative materials should be considered for the eliminator elements.

9.91 In order to minimise electrolytic action resulting from condensation on the air side, cooling coils constructed from copper tubes with copper fins and electro tinned after manufacture are preferred. Aluminium fins should only be used if vinyl coated.

9.108 In AHUs with access doors too small for a person to enter, the complete drip tray should be capable of being withdrawn. It should be clamped into the AHU with thumb screws so that it can be removed without the need for tools.

In conclusion, the findings and recommendations presented in this report are intended to provide valuable insights.

Should you require further clarification or assistance, we remain at your disposal. For further assistance on this report please contact either Jack Outram or Peter Hornby.

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HALO HVAC

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