HALO HVAC

AHU Condition Report

EastWest, Nottingham

Reference: Q1647/24.07.2024

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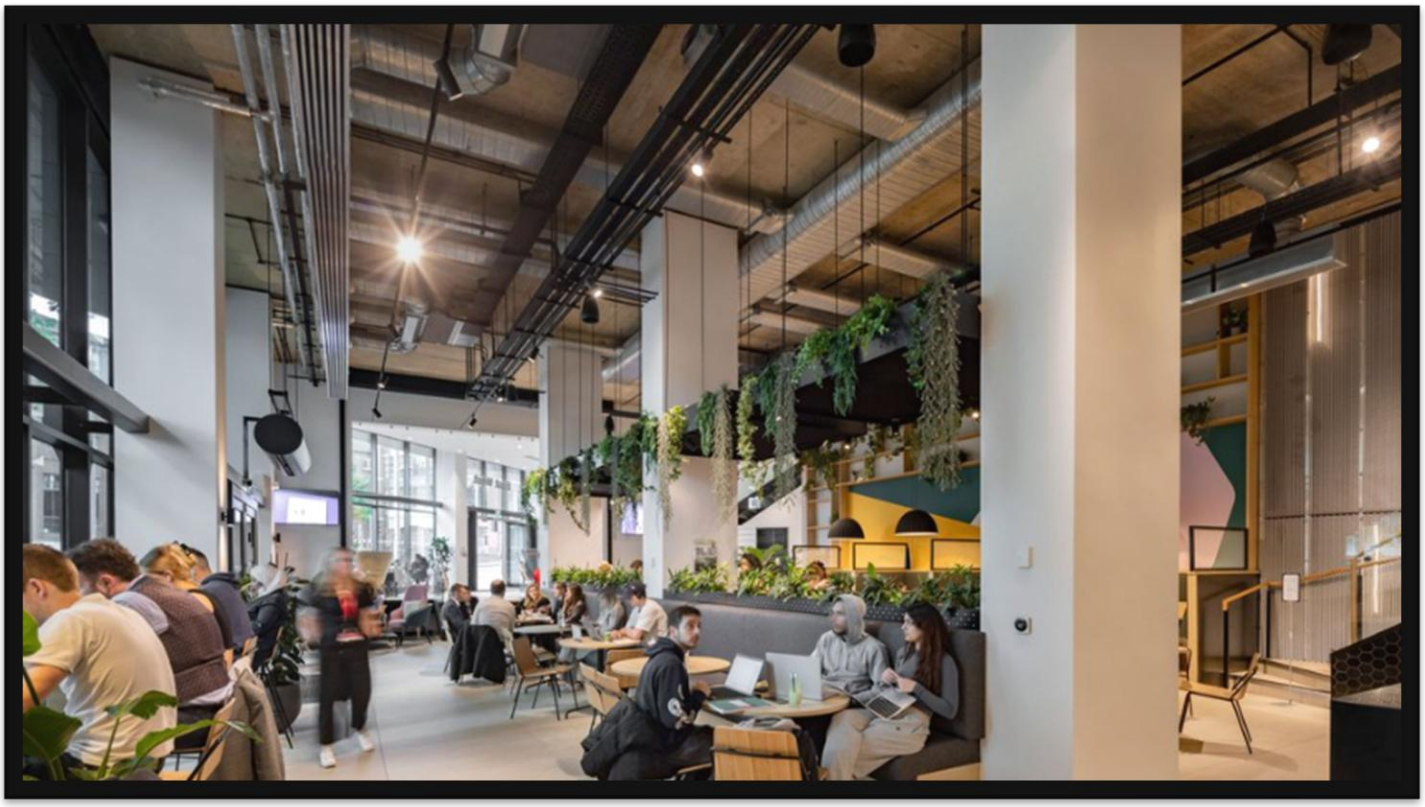

EastWest, Nottingham

Air Handling Unit - Condition Report

Report approved by

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Reference: Q1647/24.07.2024

Executive Summary

Client: EastWest, Nottingham

Location: EastWest, Tollhouse Hill, Nottingham, NG1 5FW

Date Surveyed: 3/07/2024.

Compendium:

HALO HVAC recently undertook a comprehensive inspection of the Air Handling Units (AHUs) installed at EastWest, Nottingham. Our engineers conducted a thorough assessment of the AHUs to provide a detailed report with actionable recommendations aimed at bolstering the overall reliability of the system.

Throughout our meticulous survey, our team diligently examined each component of the AHUs. The resulting report presents a comprehensive breakdown of its condition, augmented by illustrative photographs and an exhaustive list outlining recommended remedial actions.

There are multiple AHUs installed across the large commercial building, AC1 is installed in its own dedicated plant room with access gained via a corridor and double doors into the plantroom itself. AC2 and AC3 are installed in a plantroom directly above AC1. These units are almost identical in terms of components and design with opposite handings.

There are several belt driven office extract and car park extract fans installed in independent plantrooms across the building. These fans are housed in purpose-built rooms, using the fabric of the building as opposed to metal casework to create extract units. There are multiple car park supply fans installed in this same arrangement. In addition, there are numerous toilet twin extract and toilet supply units installed across the site.

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.

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.

Air Handling Unit conditions;
AC1

Project Reference:	EastWest, Nottingham	AHU Reference:	AC1
Date of Survey:	3/7/24	Condition:	

AC1

To facilitate safe access for our engineers, the Air Handling Unit (AHU) was temporarily deactivated using the local inverter installed on its casework. This allowed for a comprehensive assessment of its components. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available on-site. During our survey, we observed the inverter operating at 23.5 Hz, suggesting that the AHU is controlled via a pressure set point from the Building Management System (BMS).

The fresh air inlet for the AHU is facilitated through an external weather louvre with insect mesh affixed to the rear. The insect mesh is almost completely clogged with dirt and debris. Immediately after the fresh air intake is an inlet damper which has been damaged with almost half of the damper blades missing from the damper itself. The damper is controlled by one actuator with an interconnecting linkage connecting the top damper to the bottom damper to operate as one. Currently, the top half of the damper can open and close if the actuator is operational, however the bottom half of the damper will remain open due to the missing blades.

The frost coil is the next component within the AHU and is in poor condition with the fins deteriorating. The panel and bag filters seem to be in reasonable condition and should continue to be monitored and replaced regularly in line with ongoing maintenance requirements. An attenuator is installed after the bag filters which seems to have been installed in September 2008 and is in reasonable condition with some minor signs of corrosion.

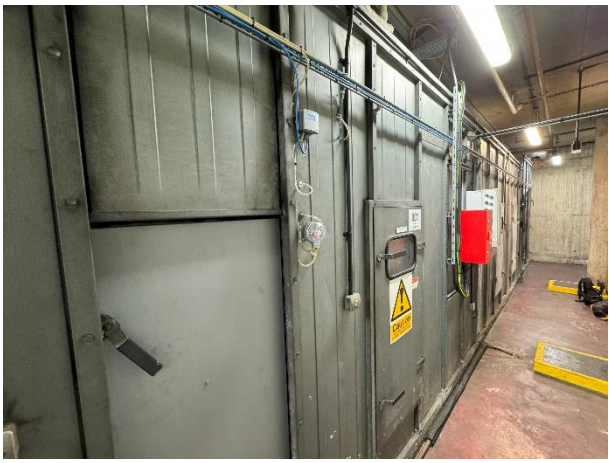
The main heating coil, like the attenuator, seems to be a replacement. Although the installation date is unclear, the coil is in reasonable condition with minor fin damage and some corrosion on the frame. The CHW cooling coil also appears to be in reasonable condition at first glance; however, thorough inspection revealed excessive corrosion around the coil headers. The associated moisture eliminators are in reasonable condition. A condensate pump is installed within the floor of the fan section, connected to the cooling coil's drain tray.

The existing belt driven fan and motor is the original from date of installation. This has surpassed its recommended CIBSE guide M life cycle by several years. We therefore recommend this is upgraded to new energy efficient direct drive EC plug fans.

The AHU branches into 3 main ducts each with their own duct mounted heating coils to provide zonal temperature control to the areas served. Immediately after the coils is a manual Volume Control Damper (VCD) to balance airflow. The coils were in poor condition and have exceeded their recommended life expectancy according to CIBSE guide M. There are small access hatches installed after the VCDs in the ductwork to facilitate cleaning the dampers and air off side of the coils. There is cabling obstructing the removal of one of the coils.

During our survey, we attempted to take pitot traverse readings in each branch of ductwork from the existing test holes. Whilst taking the readings, we encountered some anomalies and when investigating found there are duct mounted attenuators installed within each branch of duct immediately after the coils and VCDs. As a result, the readings that were taken were not suitable to establish an air volume from the AHU as ideally, we require a straight section of empty ductwork to take accurate readings.

AHU Photos:

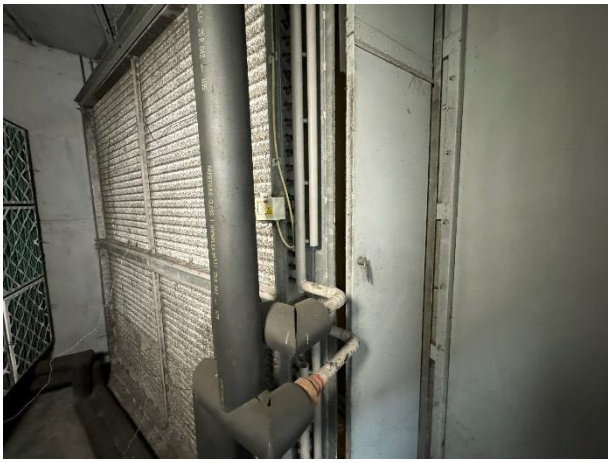


Overview of AC1

Insect mesh behind louvres

Fresh air inlet damper

Fresh air inlet damper



Frost coil

Panel filters

Attenuator

Corrosion

Main heating coil

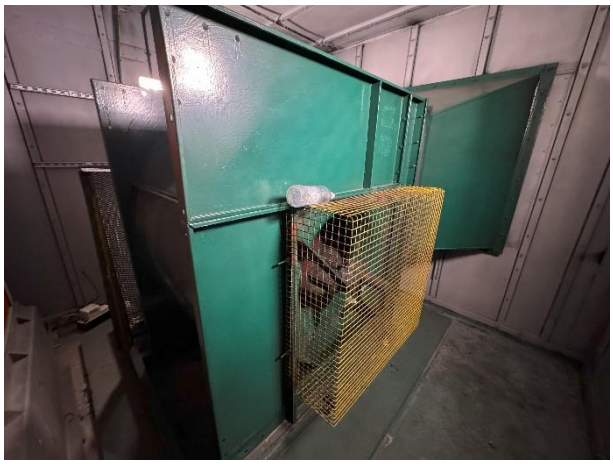
Corrosion on main heating coil

CHW cooling coil

Moisture eliminators

Corrosion on CHW coil headers

Condensate pump



Belt driven fan

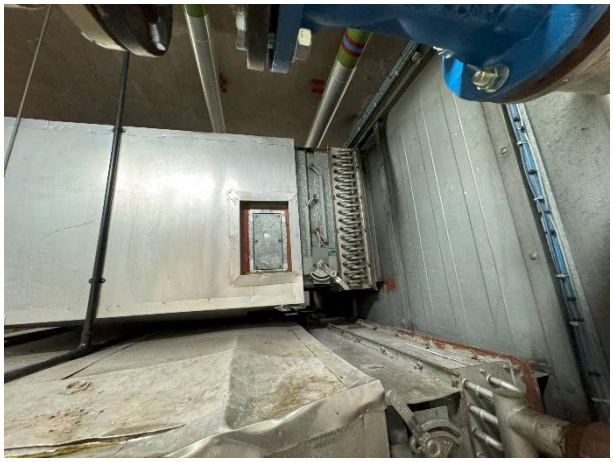
Motor

Duct mounted coil

Duct mounted coil

Duct mounted coil

Duct mounted coil, VCD, and obstructing cabling



Duct mounted coil and VCD

Duct mounted attenuator

AC1 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Remove the insect mesh on the intake louvres.
- Remove the fresh air inlet damper.
- Supply and install new G4 panel filter to the air on side of the frost coil.
- Replace the existing frost coil.
- The new frost coil should be connected to a new air source heat pump.
- Replace the panel and bag filters.
- Remove the main heating coil from the system.
- Replace the existing CHW cooling coil with a new DX heat pump coil that provides cooling and heating.
- The new DX heat pump coil should be connected to a heat pump condensing unit.
- Upgrade the existing belt driven fan and motor to new energy efficient direct drive IE6 EC plug fans to improve system reliability and energy efficiency.
- Remove the duct mounted heating coils that currently provide zonal control as we understand each floor will have its own independent zonal control via FCUs.
- Clean and lubricate the manual VCDs.
- Clean and treat the internal corrosion throughout the AHU.

Air Handling Unit conditions;
AC2

Project Reference:	EastWest, Nottingham	AHU Reference:	AC2
Date of Survey:	3/7/24	Condition:	

AC2

To facilitate safe access for our engineers, the Air Handling Unit (AHU) was temporarily deactivated using the local inverter installed on its casework. This allowed for a comprehensive assessment of its components. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records stated the capacity of the unit is 59500m³/h which equates to 16.53m³/s. During our survey, we observed the inverter operating at 34.9 Hz, suggesting that the AHU is controlled via a pressure set point from the Building Management System (BMS).

The fresh air inlet for the AHU is facilitated through an external weather louvre which has had the insect mesh removed. The inlet damper has also been removed from the AHU with a new panel filter frame installed housing 98mm deep G4 panel filters. We believe this was retrofitted to combat the issues we found when surveying AC1. There is a large amount of corrosion within this section of the AHU that should be cleaned and treated. The panel filters were dirty and should be replaced.

The frost coil is the next component within the AHU and is in reasonable condition as it appears to have been replaced at the same time the panel filters were added to the system. The panel and bag filters seem to be in reasonable condition and should continue to be monitored and replaced regularly in line with ongoing maintenance requirements.

There is not a requirement to keep two banks of the same grade of panel filters as this is adding unnecessary pressure drop to the AHU and higher maintenance costs. An attenuator is installed after the bag filters which is in reasonable condition.

The main heating coil is in reasonable condition with minor fin damage. The CHW cooling coil also appears to be in reasonable condition. There are no associated moisture eliminators for this coil. Upon closer inspection, the casework has buckled around the perimeter of the cooling coil with various popped rivets which is affecting the structural integrity of the AHU.

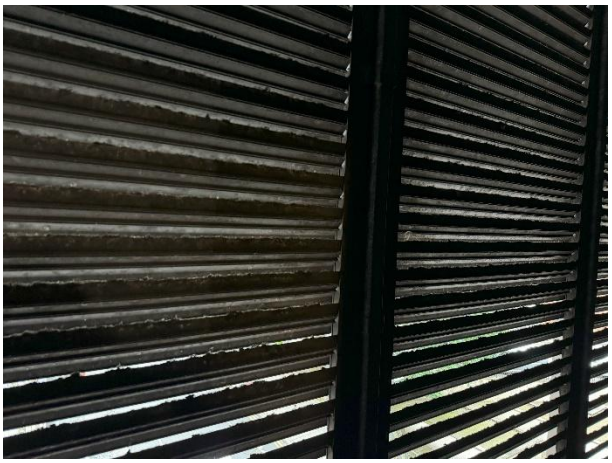
This urgently needs attention as if left has the potential to cause catastrophic failure and irreparable damage to the AHU. The drain tray of the cooling coil is in poor condition and seems to partially supported by parts of wood.

The existing belt driven fan and motor is the original from date of installation. This has surpassed its recommended CIBSE guide M life cycle by several years. We therefore recommend this is upgraded to new energy efficient direct drive EC plug fans.

Similarly to the cooling coil bulkhead and casework, the belt driven supply fan bulkhead has also buckled with rivets ripping away from the casing. By upgrading the fan to EC plug fans, this section of bulkhead will be removed with supports added where necessary to improve the structural integrity of the AHU.

The AHU branches into 2 main ducts each with their own duct mounted heating coils to provide zonal temperature control to the areas served. Immediately after the coils is a manual Volume Control Damper (VCD) to balance airflow. The coils were in poor condition and have exceeded their recommended life expectancy according to CIBSE guide M.

AHU Photos:



Inlet louvre

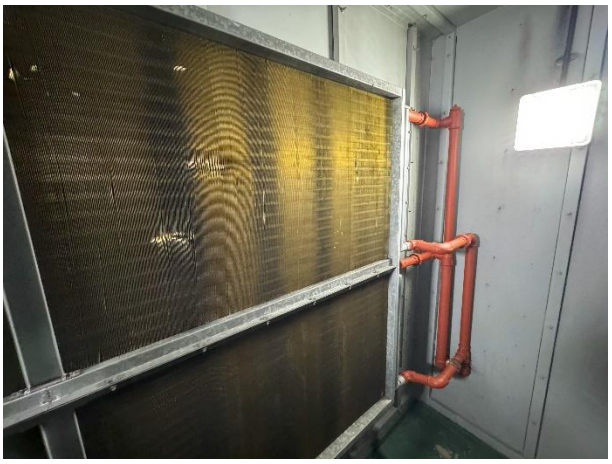
Old damper casing

New panel filter frame and filters

Corrosion

Frost coil

Panel filters



Main heating coil

CHW cooling coil buckled casework

CHW cooling coil buckled casework

CHW cooling coil buckled casework

CHW cooling coil

CHW cooling coil

CHW cooling coil

Wooden supports

Belt driven fan

Motor

Buckling casework

Buckling casework

Popped rivets

Popped rivets

Fan outlet

Duct mounted coils

AC2 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Replace the existing frost coil.
- The new frost coil should be connected to a new air source heat pump.
- Replace the panel and bag filters.
- Remove the second bank of panel filters from the AHU.
- Remove the main heating coil from the system.
- Replace the existing CHW cooling coil with a new DX heat pump coil that provides cooling and heating.
- Repair the casework around the perimeter of the new DX heat pump coil.
- The new DX heat pump coil should be connected to a heat pump condensing unit.
- Upgrade the existing belt driven fan and motor to new energy efficient direct drive IE6 EC plug fans to improve system reliability and energy efficiency.
- Remove the duct mounted heating coils that currently provide zonal control as we understand each floor will have its own independent zonal control via FCUs.
- Clean and lubricate the manual VCDs.
- Clean and treat the internal corrosion throughout the AHU.

We also surveyed AC3 whilst on site and found the unit to be identical in terms of design, component layout, and condition with the inverter running at 40Hz. One of the duct mounted coils for AC3 has had some repairs to the tube of the coil.

AC3 Coil repair

Air Handling Unit conditions;
Car Park Extract ME10

Project Reference:	EastWest, Nottingham	AHU Reference:	ME10
Date of Survey:	3/7/24	Condition:	

ME10

The car park extract fan is installed within a purpose-built room that acts as an air handling unit using the fabric of the building as the casework. There was no local isolator for the fan. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available. The fan data plate stated the capacity of the fan is 42500m³/h which equates to 11.8m³/s.

The existing belt driven fan is the original from date of installation, this has surpassed its recommended CIBSE guide M life cycle by several years. We therefore recommend this is upgraded to new energy efficient direct drive EC plug fans. The fan is connected to run and standby motors which appear to have been replaced in 2007.

There is an attenuator installed directly after the fan outlet with no access to inspect the condition. The brickwork is exposed around the perimeter of the double doors leading to the fan, we would recommend this is repointed as we expect the excessive negative pressure build up within the room could eventually cause large fragments of brick to break away and cause damage to the mechanical components.

AHU Photos:

Belt driven fan and attenuator

Entrance to plantroom

Damage to building fabric

Damper

Belt driven fan and attenuator

Car Park Extract ME10 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Upgrade the existing belt driven fan and motor to new energy efficient direct drive IE6 EC plug fans to improve system reliability and energy efficiency.
- Due to the construction of the room that houses the fan, we recommend the new EC plug fans are installed in their own dedicated casework as the change from negative to positive pressure within the fan chamber could cause damage to the building fabric and significant air leakage.

Air Handling Unit Conditions;
Car Park Extract ME11 (reference TBC)

Project Reference:	EastWest, Nottingham	**AHU Reference:**	ME11 (reference TBC)
Date of Survey:	3/7/24	**Condition:**	

ME11

The car park extract fan is installed within a purpose-built room that acts as an air handling unit using the fabric of the building as the casework. There was no local isolator for the fan. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available. The room that houses the fan had large amounts of bird excrement along with some dead pigeons. We therefore did not take any details from this plantroom.

Before any works are conducted in this plantroom, there is a requirement for a deep clean by a specialist contractor.

AHU Photos:

Belt Driven Fan

Belt Driven Fan

Car Park Extract ME11 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Deep clean the plantroom prior to any works.
- Upgrade the existing belt driven fan and motor to new energy efficient direct drive IE6 EC plug fans to improve system reliability and energy efficiency.
- Due to the construction of the room that houses the fan, we recommend the new EC plug fans are installed in their own dedicated casework as the change from negative to positive pressure within the fan chamber could cause damage to the building fabric.

Air Handling Unit conditions;
Office Extract ME4

Project Reference:	EastWest, Nottingham	AHU Reference:	ME4
Date of Survey:	3/7/24	Condition:	

ME4

The office extract fan is installed within a purpose-built room that acts as an air handling unit using the fabric of the building as the casework. There was no local isolator for the fan. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available. The capacity of Office Extract ME1 according to some O&Ms is 13500CFM which equates to 6.37m³/s.

The existing belt driven fan is the original from date of installation, this has surpassed its recommended CIBSE guide M life cycle by several years. We therefore recommend this is upgraded to new energy efficient direct drive EC plug fans.

There is an attenuator installed directly after the fan outlet which seems in reasonable condition.

AHU Photos:

Belt Driven Fan

Attenuator and exhaust louvre

Office Extract ME4 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Upgrade the existing belt driven fan and motor to new energy efficient direct drive IE6 EC plug fans to improve system reliability and energy efficiency.
- Due to the construction of the room that houses the fan, we recommend the new EC plug fans are installed in their own dedicated casework as the change from negative to positive pressure within the fan chamber could cause damage to the building fabric.

We also surveyed various other office extract fans whilst on site (ME3, and ME5) and found the units to be similar in terms of design, component layout, and condition. We would suggest they were all designed to achieve identical or similar duties.

ME3

ME5

Air Handling Unit conditions;
Car Park Supply MV1

Project Reference:	EastWest, Nottingham	AHU Reference:	ME1
Date of Survey:	3/7/24	Condition:	

MV1

The car park supply fan is installed within a purpose-built room that acts as an air handling unit using the fabric of the building as the casework. There was no local isolator for the fan. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available.

The existing belt driven fan is the original from date of installation, this has surpassed its recommended CIBSE guide M life cycle by several years. We therefore recommend this is upgraded to new energy efficient direct drive EC plug fans.

AHU Photos:

Belt Driven Fan

Car Park Supply MV1 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Upgrade the existing belt driven fan and motor to new energy efficient direct drive IE6 EC plug fans to improve system reliability and energy efficiency.
- Due to the construction of the room that houses the fan, we recommend the new EC plug fans are installed in their own dedicated casework as the change from negative to positive pressure within the fan chamber could cause damage to the building fabric.

We also surveyed various other car park supply fans whilst on site (MV2, MV3, and MV4) and found the units to be similar in terms of design, component layout, and condition. We would suggest they were all designed to achieve identical or similar duties.

MV2

MV3

MV4

Air Handling Unit conditions;
Toilet Extract ME7 and Toilet Supply HV2

Project Reference:	EastWest, Nottingham	AHU Reference:	ME7 and HV2
Date of Survey:	3/7/24	Condition:	

ME7

The toilet twin extract is installed above the Car Park ME10 plantroom with access gained via a ladder. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available.

Due to the size of the unit, it is not economical to refurbish therefore we would recommend replacing the unit in its entirety with a new twin extract unit containing energy efficient direct drive EC plug fans.

As there are no design flow rates, we would base our selection for a replacement unit on the average velocity through the ductwork of around 7m/s.

HV2

The toilet supply unit is installed above the Car Park ME10 plantroom with access gained via a ladder. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available.

Due to the size of the unit, it is not economical to refurbish therefore we would recommend replacing the unit in its entirety with a new supply unit containing energy efficient direct drive EC plug fans.

As there are no design flow rates, we would base our selection for a replacement unit on 85% of the duty of the toilet twin extract to ensure a negative pressure is maintained.

AHU Photos:

ME7

HV2

Toilet Extract ME7 and Toilet Supply HV2 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Replace both the AHUs with new energy efficient versions c/w standalone controls.
- The new supply unit to contain an electric heater battery to negate the heating requirement from the boilers.

Air Handling Unit conditions;
Toilet Extract ME6 and Toilet Supply HV1

Project Reference:	EastWest, Nottingham	AHU Reference:	ME6 and HV1
Date of Survey:	3/7/24	Condition:	

ME6

The toilet twin extract is suspended from the ceiling using drop rods in a roof top plantroom. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available. We understand one of the motors within the unit is faulty and there is no auto changeover panel for the unit which results in the onsite engineer having to manually change over the motors.

Due to the size of the unit, it is not economical to refurbish therefore we would recommend replacing the unit in its entirety with a new twin extract unit containing energy efficient direct drive EC plug fans.

As there are no design flow rates, we would base our selection for a replacement unit on the average velocity through the ductwork of around 7m/s.

HV1

The toilet supply unit is installed in the same rooftop plantroom. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available.

Due to the size of the unit, it is not economical to refurbish therefore we would recommend replacing the unit in its entirety with a new supply unit containing energy efficient direct drive EC plug fans.

As there are no design flow rates, we would base our selection for a replacement unit on 85% of the duty of the toilet twin extract to ensure a negative pressure is maintained.

AHU Photos:

ME6

HV1

Toilet Extract ME6 and Toilet Supply HV1 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Replace both the AHUs with new energy efficient versions c/w standalone controls.
- The new supply unit to contain an electric heater battery to negate the heating requirement from the boilers.

Air Handling Unit conditions;
Toilet Extract ME8 and Toilet Supply HV3

Project Reference:	EastWest, Nottingham	AHU Reference:	ME8 and HV3
Date of Survey:	3/7/24	Condition:	

ME8

The toilet twin extract is suspended from the ceiling using drop rods in a roof top plantroom. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available.

Due to the size of the unit, it is not economical to refurbish therefore we would recommend replacing the unit in its entirety with a new twin extract unit containing energy efficient direct drive EC plug fans.

As there are no design flow rates, we would base our selection for a replacement unit on the average velocity through the ductwork of around 7m/s.

HV3

The toilet supply unit is installed in the same rooftop plantroom. Unfortunately, the original design data for the AHU is unavailable; however, some Operation and Maintenance (O&M) records may be available.

Due to the size of the unit, it is not economical to refurbish therefore we would recommend replacing the unit in its entirety with a new supply unit containing energy efficient direct drive EC plug fans.

As there are no design flow rates, we would base our selection for a replacement unit on 85% of the duty of the toilet twin extract to ensure a negative pressure is maintained.

AHU Photos:

ME8

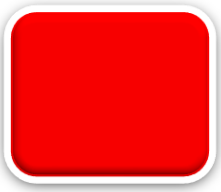
HV3

Toilet Extract ME8 and Toilet Supply HV3 Condition report recommendations:

We understand the site has a requirement to decarbonise therefore our AHU condition report recommendations are based on the condition of the AHU with an objective of decarbonising and improving energy efficiency.

- Replace both the AHUs with new energy efficient versions c/w standalone controls.
- The new supply unit to contain an electric heater battery to negate the heating requirement from the boilers.

Conclusion



- 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.

There are several key actions that are recommended in respect of the air handling units AC1, AC2, and AC3. The belt driven fans and motors should be upgraded to extend the life cycle of the AHUs whilst also improving the energy efficiency of units. By upgrading to direct drive EC plug fans there will be a reduction in ongoing maintenance requirements as the new EC plug fans do not utilise belts and pulleys.

Furthermore, there are numerous other works to be completed to improve performance and reliability of the existing AHUs. The insect mesh and damper for AC1 should be removed and new G4 panel filter frame installed similar to the works already completed for AC2 and AC3.

The AHUs should only contain one set of G4 panel filters as having two banks of these filters does not offer any practical benefit and actually increases the pressure drop of the unit resulting in a higher energy consumption and also increase ongoing maintenance costs to replace the filters.

From a decarbonisation perspective, we understand the site wish to remove the gas boilers which in turn would require the heating coils from within the AHUs to be replaced to suit new alternatives. The options for the replacement heating coils would be either electric heater batteries or LTHW coils connected to air source heat pumps instead of gas boilers.

Both options have advantages and disadvantages. The electric heater batteries would require a substantial 3-phase electrical supply and would require controls modifications to operate a thyristor to modulate the EHB to achieve the required set point. Based on the estimated air volume for AC2 of 16.53m³/s and a ΔT requirement of 17°C, the KW rating of the EHB would be approximately 346kW which would require 500 A 3-phase supply per phase. The surface temperature of the elements of an electric heater battery are designed to be 400°C at an air velocity of 2.5m/s therefore can pose potential fire risks with cardboard pre filters that can become dislodged.

The LTHW coil connected to an air source heat pump would require structural surveys completing on the roof to locate a suitable position to mount the new ASHP. New pipework would also be required to connect the ASHP to the new frost coil along with new mains electrical supplies and controls modifications.

We also understand that the existing chillers/cooling towers only serve the CHW cooling coils within the AHUs and the site plan on removing these in the future. We therefore would propose that the existing CHW cooling coils are replaced with new DX heat pump coils that provide cooling and heating. It is important to ensure a minimum air on temperature of 12°C to the DX heat pump coil is maintained to ensure the heat pump function operates correctly. This necessitates the importance of ensuring the existing LTHW frost coil is upgraded as mentioned above. By upgrading the existing CHW cooling coil to a DX heat pump coil, the main heating coil within the AHUs will become redundant and can be removed from the system to reduce overall pressure drop.

New DX heat pump condensing units will be required to suit the new DX heat pump coil. This will require further structural investigation to locate a suitable location on the roof to mount the condensing units.

The duct mounted heating coils within the branches of ductwork should be removed as they currently provide zonal heating control for the areas served which is no longer required for the several floors that have their own dedicated fan coil units controlling the temperature. We understand the floors that currently don't have FCUs installed will be having them installed in the future.

The car park extracts, car park supplies, and office extracts should all be upgraded energy efficient direct drive EC plug fans. This will typically see approximately 30% energy savings and there will be a reduction in ongoing maintenance requirements as the new EC plug fans do not utilise belts and pulleys.

The toilet twin extract units and supply units should be replaced in their entirety with the new units designed with standalone controls that provide auto changeover functionality. The new units will contain direct drive EC plug fans resulting in little maintenance requirements for these units.

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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