HALO HVAC

AHU Condition Report

The National Maritime College of Ireland (NMCI)

Reference: Q1715/NMCI/04.05.2025

HALO HVAC - AHU condition reports are warrantable for the use of EU, Irish & UK 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.

HALO HVAC

The National Maritime College of Ireland (NMCI)

Air Handling Unit Condition Report

Report approved by

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About

The National Maritime College of Ireland (NMCI), located in Ringaskiddy, County Cork, is Ireland's premier maritime training facility and among the most advanced in Europe. Established in 2004 as a joint venture between Cork Institute of Technology (now part of Munster Technological University, MTU) and the Irish Naval Service, NMCI serves both civilian maritime and defense sectors. It offers a range of undergraduate and postgraduate programs in nautical science, marine engineering, and maritime studies, aligned with international standards such as the STCW.

The campus features cutting-edge facilities including bridge and engine room simulators, fire training grounds, and survival pools. Through its commercial arm, SEFtec NMCI Offshore, it delivers bespoke training to international shipping companies and naval forces. Strategically located near Cork's deep-water port and the Naval Base at Haulbowline, NMCI plays a key role in global maritime education and innovation.

As part of MTU, NMCI supports Ireland's climate goals and the European Green Deal through its involvement in MTU's 10-Year Sustainability Strategy, targeting a 51% reduction in emissions by 2030 and net-zero by 2050. Sustainability is integrated into both academics and operations, with programs like the MSc in Global Sustainable Supply Chain Management preparing professionals for leadership in a decarbonising industry.

Partnerships with Green Tech Skillnet and CILT Mobility & Supply Chain Skillnet enhance workforce development in renewable energy and offshore operations. NMCI also participates in projects like NETMAR to promote environmental sustainability and maritime heritage across the Atlantic region.

Through these concerted efforts, NMCI is positioning itself as a leader in maritime decarbonisation, fostering innovation and sustainability in maritime education and operations.

Executive Summary

On the 29th of April, HALO HVAC successfully carried out a comprehensive inspection of the Air Handling Units (AHUs) at the National Maritime College of Ireland (NMCI). This essential assessment was aimed at evaluating both the operational performance and overall condition of the AHUs to ensure continued efficiency, reliability, and compliance with current industry and energy standards.

Our experienced HVAC engineer conducted an in-depth inspection of all AHUs, covering both supply and extract systems. Key components were assessed, including:

- **Filters:** Checked for blockages, pressure drops, and suitability for current IAQ (indoor air quality) demands.
- **Fans:** Assessed for wear, balance, vibration, and energy efficiency (including motor type and potential for EC upgrades);.
- **Heating/Cooling Coils:** Inspected for cleanliness, corrosion, and heat transfer performance.
- **Dampers and Actuators:** Verified for proper operation and control responsiveness.
- **Controls and Sensors:** Evaluated BMS integration, sensor calibration, and operational sequencing.
- **Airflow Dynamics:** Measured to confirm correct volume flow rates and system balancing.

Energy Saving Assessment:

A key focus of the inspection was energy performance. The engineer reviewed operational data, component performance, and physical condition to identify energy-saving opportunities such as:

- **Fan Efficiency Improvements:** Noted potential for retrofitting traditional belt-driven fans with EC (electronically commutated) fans, reducing energy consumption and maintenance needs.
- **Control Optimization:** Identified possibilities for improved setpoint scheduling, modulation control, and demand-based ventilation via BMS.
- **Filter Strategy Review:** Assessed whether filter types and replacement schedules are contributing to excessive pressure drops and unnecessary fan energy use.
- **Heat Recovery Performance:** Evaluated recovery unit effectiveness (where present), with recommendations to optimize thermal efficiency.

These insights provide a foundation for targeted energy efficiency upgrades, with potential to reduce operational costs and environmental impact while maintaining indoor air quality and occupant comfort.

The HALO AHU Condition Report Key

The HALO Air Handling Unit 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**). Life cycle cost analysis as per Public Spending Code **(PSC)** ,The Office of Public Works Governance Framework **(OPW)** and the Compliance with EU/Irish Building Regulations.

- 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
- Public Spending Code
- The Office of Public Works Governance Framework
- EU / Irish Building Regulations (Part L – Energy, Part F – Ventilation)

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.

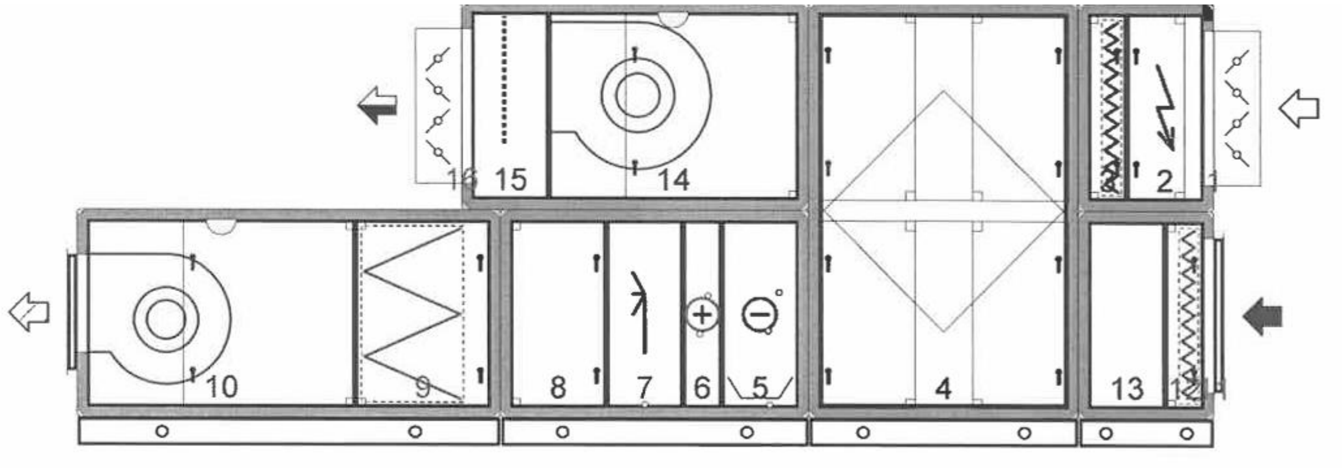
- Functioning at time of survey, however condition indicates that remedial works are required.
- Additional maintenance required.
- Some components are approaching the end of their life expectancy according to CIBSE guide M Appendix 12.A1: Indicative economic life expectancy.

- 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.

Condition

AHU03 - Small Simulator

AHU drawing



Unit Overview:

This AHU, manufactured by Flakt approximately 22 years ago, is located internally within an upper level internal plantroom and was originally designed to achieve 3.32m³/s @ 300Pa for Supply Air and 3.32m³/s @ 300Pa for Exhaust Air.

The AHU consists of a fresh air inlet damper, electric frost coil, panel and bag filters, two belt driven fan and motors, Heating & Cooling coils and Heat Exchanger. There is also a humidifier that has been disconnected leaving it redundant. Externally the unit appears to be in good condition. There doesn't appear to have been any major repairs or retrofits along any section.

Intake Section:

Immediately downstream of the intake duct is an empty section with no provision for maintenance access. As this is the first contact point for incoming supply air—exposed to salt-laden air from nearby Cork Harbour—there is a significant risk of debris accumulation and corrosion. We recommend a detailed intrusive inspection of this area, followed by retrofitting appropriate access and inspection panels to facilitate ongoing maintenance.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The Dampers appeared to function correctly during local isolation and when switching on the fans.

Electric Heater Battery (EHB):

Going from intake to discharge, next is the electric heater battery (EHB). It is designed to raise incoming air from -3 °C to 5 °C, providing frost protection for all downstream components. It delivers a total heating capacity of 32 kW. While this may appear modest, it is appropriately sized given the average winter temperatures at Cork Harbour, which range from 8 °C to 10 °C during the day and 2 °C to 5 °C at night (December to February). Frost occurrence is infrequent due to the coastal influence of the nearby Atlantic Ocean.

Concerningly the EHB is currently installed with only 150 mm clearance from cardboard panel filters.

While there is no specific Irish regulation mandating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidance generally recommend a minimum clearance of 300 mm.

This spacing is essential to:

- Prevent filter overheating
- Reduce fire risk, especially with synthetic or combustible media
- Ensure uniform airflow and prevent hot spots that could damage components

Additional Best Practices:

- Where reduced spacing is unavoidable, use non-combustible or metal-framed filters
- Include airflow interlocks and high-temperature cut-outs for safety

We recommend replacing the existing EHB and repositioning the panel work to provide a clearance exceeding 300 mm, ensuring full compliance with international fire safety and operational efficiency standards. Furthermore, we advise upgrading to a modern, energy-efficient EHB capable of delivering the same heating output with lower power consumption, thereby improving system performance and reducing operational costs.

Panel Filter Wall:

This section contains:

- 2x 1/1 G3 filters
- 3x ½ G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 59 Pa, with a recommended final pressure drop of 129 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 9.5 °C, and an exhaust air range of 21 °C down to 8.5 °C. It provides 50.4 kW of heat recovery, equating to a thermal efficiency of 52.3%.

While the unit appears to be in good physical condition, the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m³/h—this unit operates at approximately 11,952 m³/h, well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Cooling coil:

The existing cooling coil, rated at 32 kW, is now 22 years old and likely operating well below its original design capacity. Industry data suggests that after two decades, cooling coils typically experience a 20% to 40% reduction in performance due to factors such as fin surface fouling, internal corrosion, and reduced airflow—especially in coastal environments like Cork Harbour where salt-laden air accelerates degradation.

For this coil, the effective cooling output may now be closer to 24–27 kW under typical conditions.

Given that the typical lifespan of a cooling coil is 15–20 years, and this unit has exceeded that range, replacement should be seriously considered. A new coil would not only restore full capacity but also offer improved efficiency, potentially lower pressure drops, and reduced energy consumption—making it a worthwhile investment in both performance and compliance.

Heating Coil:

Next up we have the heating coil, with very brittle fins. Again as the cooling coil: The existing heating coil, rated at 52.2 kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 31–42 kW of effective heating.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Humidifier:

The humidifier was found to be isolated and effectively redundant at the time of our survey. This may be due to a combination of factors, including operating costs, maintenance burdens, health and safety risks, and the adoption of modern ventilation strategies that reduce the need for active humidification.

Note; In temperate maritime climates like Ireland, indoor humidity levels often remain within acceptable ranges without intervention. Historically, some manufacturers—such as Fläkt—routinely included humidifiers as standard components, often as a sales-driven upsell, even where humidity control was not operationally essential. In practice, humidification is only critical in specific environments such as hospitals, clean rooms, data centres, museums, and pharmaceutical or precision manufacturing facilities.

That said, it is important to note that this humidifier is positioned downstream of the heating coil, where relative humidity naturally drops as air is warmed. Therefore, a more detailed assessment is recommended to determine whether the humidifier was ever functionally required, or if its redundancy has had any unintended impact on indoor air quality or comfort.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. Both the filters and their frames appear to be in generally ok condition, requiring minor rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Given that the AHU operates at 3.32 m^3/s with 300 Pa available pressure, there are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven fan and 7.5 kW motor, manufactured in 2003, are now over 22 years old—well beyond the typical service life expectancy for such components.

These systems were originally designed to deliver 300 Pa of external static pressure, yet current measurements indicate only 208 Pa is being achieved. This represents a 33% drop in pressure performance, while the motor likely continues to draw near its full rated power.

As a result, the system is operating inefficiently, with a significant portion of the electrical input lost due to mechanical wear and reduced airflow output. Degradation in components such as belts, pulleys, bearings, and impellers over time leads to slippage, vibration, and loss of fan speed—all contributing to reduced system performance.

Given this level of underperformance and the age of the equipment, we recommend retrofitting the system with EC (electronically commutated) fans as soon as possible. EC fans offer superior energy efficiency, variable-speed control, and eliminate belt losses entirely, providing more precise airflow management and significantly lower power consumption.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Panel Filter Wall:

Going back through exhaust section, and after the heat exchanger that was covered earlier in this document, we have another panel filter wall. This section contains:

2x 1/1 G3 filters
3x ½ G3 filters

The filters are rated for an initial pressure drop of 59 Pa, with a recommended final pressure drop of 129 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition. The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance

Exhaust Fan Section

Almost identical to the supply fan, this fan instead has a motor of 5.5 kW motor, manufactured in 2003 is also over 22 years old—well beyond the typical service life expectancy for such components.

These systems were originally designed to deliver 300 Pa of external static pressure, yet current measurements indicate only around 266 Pa is being achieved. There is an 11.3% drop in external static pressure performance compared to the design specification, while the motor likely continues to draw near its full rated power.

As a result, the system is operating inefficiently, with a significant portion of the electrical input lost due to mechanical wear and reduced airflow output. Degradation in components such as belts, pulleys, bearings, and impellers over time leads to slippage, vibration, and loss of fan speed—all contributing to reduced system performance.

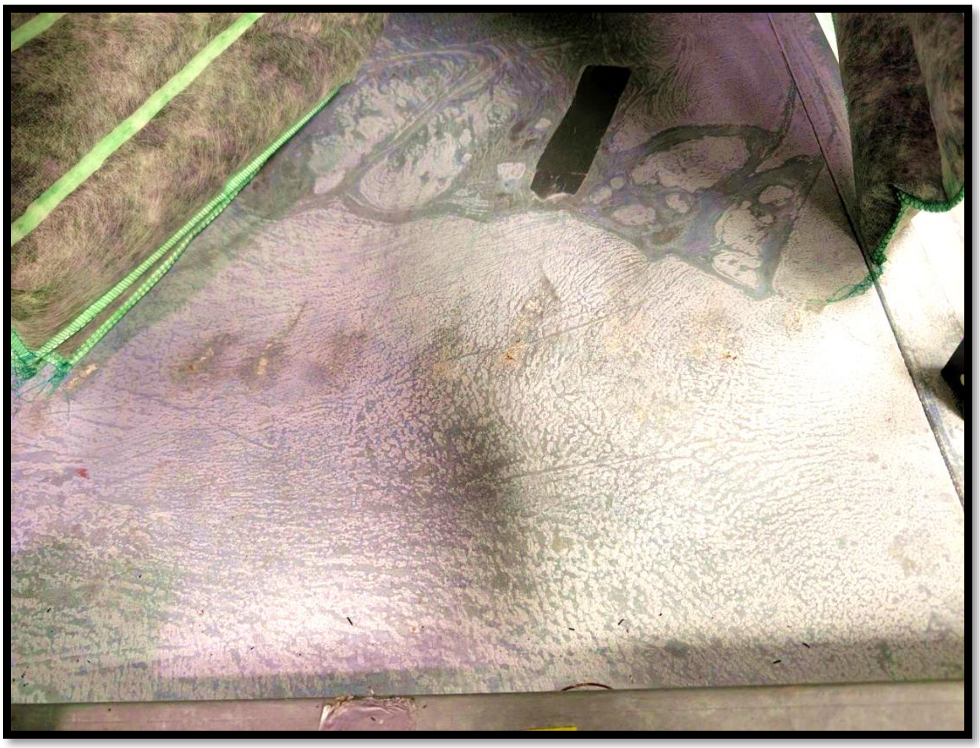
Given this level of underperformance and the age of the equipment, we recommend retrofitting the system with EC (electronically commutated) fans as soon as possible. EC fans offer superior energy efficiency, variable-speed control, and eliminate belt losses entirely, providing more precise airflow management and significantly lower power consumption.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

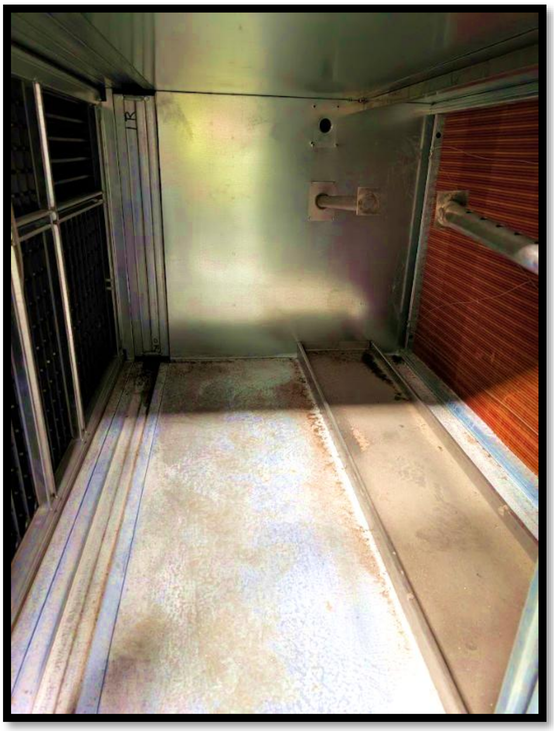
Photos

AHU03 - Small Simulator

Supply Fan Section

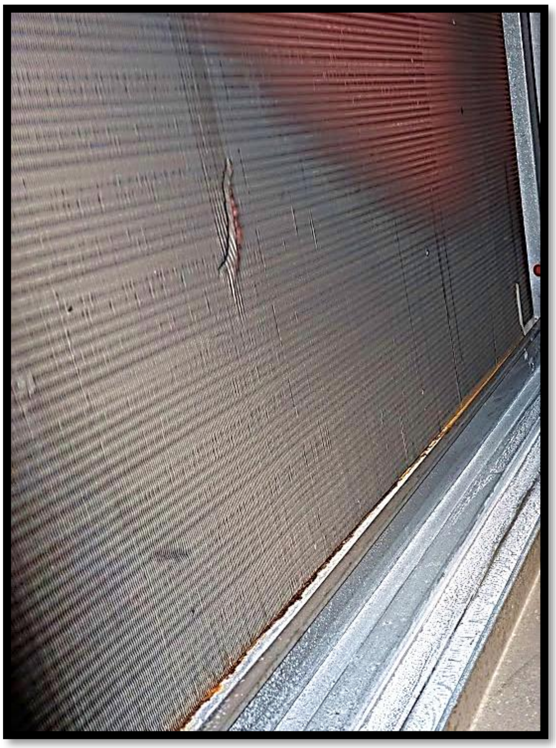


Supply Fan Section Floor Debris/Corrosion

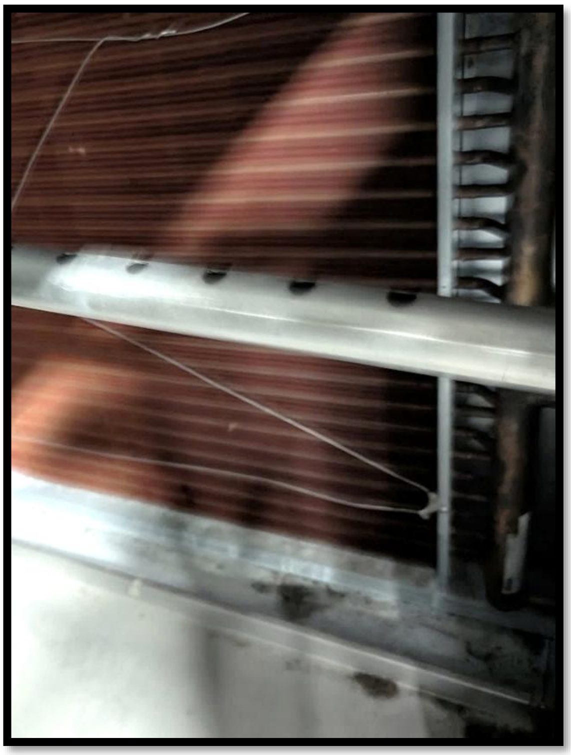


Humidifier Section Corrosion

Heat Exchanger



Cooling Coil Heavily Clogged

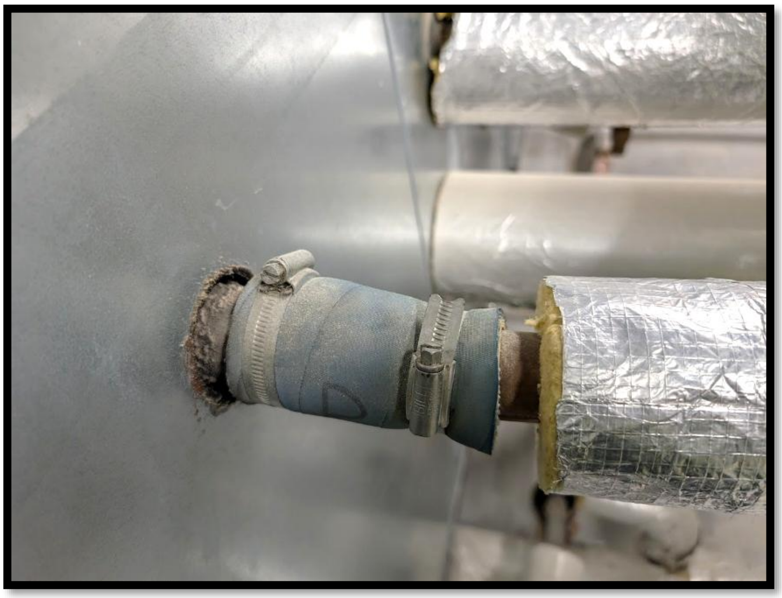


Heating Coil Rusting

Exhaust Fan Section

Exhaust Filter Section Collapse/Corrosion

Intake Filter Section Collapse/Corrosion



Missing Flange - Air Leak

Exhaust Damper Actuator

Supply Damper Actuator

Redundant Humidifier

Conclusion

AHU03 - Small Simulator

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Although the AHU remains structurally serviceable, multiple components—including the cooling and heating coils, belt-driven fans, electric heater battery, and plate heat exchanger—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU03 is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU03 - Small Simulator

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.
- Apply corrosion-resistant coatings where rust is present.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Possible damper and actuator replacement required.
- Install access panels for ongoing maintenance and inspection.

Electric Heater Battery

- Replace the EHB with a modern, energy-efficient equivalent.
- Reconfigure panel layout to provide ≥300 mm clearance from filters, as per best practice.
- Install non-combustible filters or thermal protection if clearance cannot be achieved.

Panel Filter Wall

- Treat rust on filter frames or replace affected sections.
- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Bag Filters

- Upgrade existing F7 (EU7) bag filters to ISO ePM1 60% advanced synthetic filters with:
    - Lower pressure drop
    - Extended service life
    - Eurovent A+ energy efficiency rating

Plate Heat Exchanger

- Replace with a modern unit achieving ≥75% efficiency to comply with EU Ecodesign Regulation.
- Include integral damper replacement.

Cooling Coil

- Replace 32 kW coil due to 20–40% performance degradation from age and corrosion.
- A new coil will restore full cooling capacity and improve energy performance.

Heating Coil

- Replace 52.2 kW coil showing fin brittleness and capacity loss.
- Upgrade to reduce energy use and maintain heating reliability.

Humidifier

- Conduct an assessment to determine whether reactivation or full removal is appropriate.
- Consider removing if not required for indoor air quality or process humidity control.

Supply Fan & Motor

- Replace the belt-driven 7.5 kW fan/motor with an EC fan:
    - Improves efficiency
    - Eliminates belt losses
    - Enables precise airflow control
    - ROI estimated at ~2.2 years

Exhaust Fan & Motor

- Retrofit the 5.5 kW exhaust fan with an EC fan system for the same benefits listed above.

Exhaust Panel Filters

- Treat or replace corroded frames.
- Consider upgrading to low-resistance G4 or ePM10 filters for energy savings.

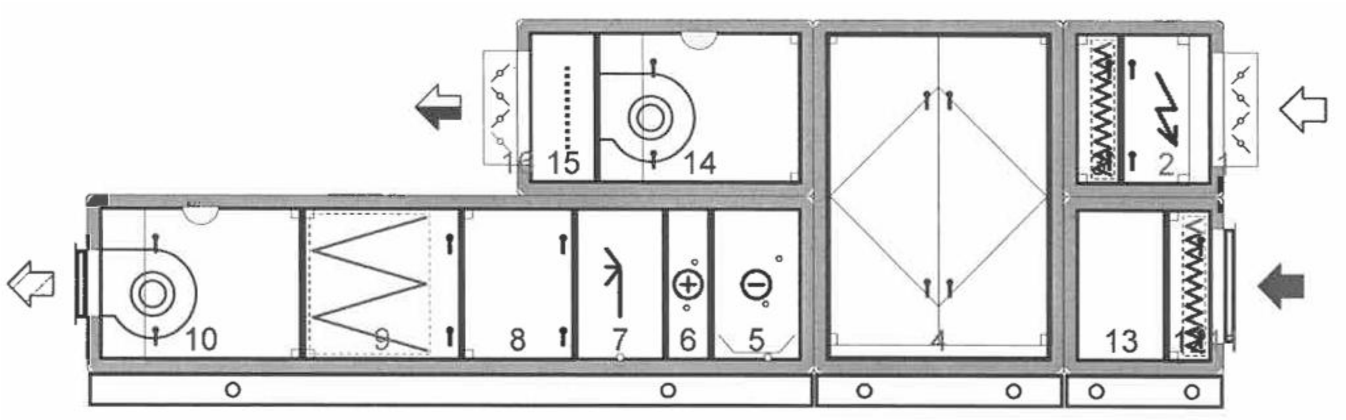
Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

HALO HVAC

Condition

AHU01 – 360 Simulator

AHU drawing



Unit Overview:

This Air Handling Unit (AHU), manufactured by Fläkt approximately 22 years ago, is installed within an internal plantroom located on an upper level. It was originally specified to deliver 6.1 m^3/s at 300 Pa for supply air and 0.61 m^3/s at 300 Pa for exhaust air.

The unit features a fresh air intake damper, electric frost coil, panel and bag filtration, two belt-driven fans with motors, heating and cooling coils, and a heat exchanger. Although a humidifier is present, it has been disconnected and is currently non-operational. The external condition of the AHU appears generally good, with no visible signs of significant repairs or retrofitting across its components.

Intake Section:

Directly downstream of the intake duct is an empty section that lacks maintenance access. As this is the initial point of contact for incoming supply air—subject to salt-laden air from the nearby Cork Harbour—it presents a high risk for debris buildup and potential corrosion. We recommend carrying out a thorough intrusive inspection of this area, followed by the installation of suitable access and inspection panels to support ongoing maintenance efforts.

Intake Dampers:

Located downstream of the intake duct are the intake dampers, which are operated by an external actuator and interlocked with the fan operation. It is currently unclear whether these dampers can also be modulated via the Building Management System (BMS). Similar to the upstream intake section, there is no provision for maintenance access in this area. We recommend a comprehensive intrusive inspection, along with the installation of appropriate access and inspection panels to enable safe and effective maintenance. The dampers appeared to operate correctly during both local isolation and fan start-up tests..

Electric Heater Battery (EHB):

Following the intake section, the next component in the airflow path is the Electric Heater Battery (EHB). This unit is designed to increase the temperature of incoming air from -3 °C to 7.8 °C, thereby providing frost protection for all subsequent components. The EHB delivers a total heating capacity of 8 kW. While this capacity may appear limited, it is suitably sized for the climatic conditions at Cork Harbour, where typical winter daytime temperatures range between 8 °C and 10 °C, and nighttime lows range from 2 °C to 5 °C (December to February). Frost is relatively rare due to the moderating influence of the nearby Atlantic Ocean.

Of concern is the current installation, where the EHB is positioned just 150 mm from adjacent cardboard panel filters.

Although there is no specific Irish regulation stipulating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidelines generally recommend a clearance of at least 300 mm. This spacing is critical for the following reasons:

- To prevent overheating of the filters
- To mitigate fire risks, particularly with synthetic or combustible filter media
- To ensure even airflow distribution and avoid hot spots that may damage downstream components

Additional best practices include:

- Specifying non-combustible or metal-framed filters when adequate clearance cannot be achieved
- Incorporating airflow interlocks and high-temperature cut-outs for enhanced safety

We recommend replacing the existing EHB and modifying the surrounding panel arrangement to provide a clearance of at least 300 mm, in line with international safety and performance standards. In addition, upgrading to a modern, energy-efficient EHB with equivalent heating output is advised to enhance energy efficiency and reduce ongoing operating costs.

Panel Filter Wall:

This section contains:

- 1x 1/1 G3 filters

Immediately downstream of the EHB is a panel filter wall equipped with G3-rated filters. These filters are specified for an initial pressure drop of 34 Pa and a recommended final pressure drop of 104 Pa. While defined maintenance and replacement schedules were not available, all filters observed during inspection appeared to be in generally good condition.

No significant signs of rust or corrosion were evident in this area. It is recommended that the use of higher-efficiency panel filters be considered, as they may help to reduce overall airflow resistance and improve fan performance.

Plate Heat Exchanger:

The next component in the airflow sequence is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 9.3 °C and an exhaust air range from 21 °C down to 8.7 °C. It provides a heat recovery output of 9.1 kW, corresponding to a thermal efficiency of 51.4%.

Although the unit appears to be in good physical condition, its calculated efficiency is significantly below current regulatory standards. In accordance with the EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum required thermal efficiency for heat recovery systems in non-residential ventilation units is:

≥ 67% for all systems (general requirement)

≥ 73% for plate-type heat exchangers

These thresholds apply to units with an airflow rate above 250 m³/h; this system operates at approximately 2,196 m³/h, well above the regulatory cutoff.

To ensure compliance with current legislation and improve overall energy performance, we recommend replacing the existing heat exchanger and its associated damper. A modern, high-efficiency unit is expected to exceed 75% thermal efficiency, enhancing energy recovery, lowering operational costs, and supporting sustainability and compliance objectives.

Cooling coil:

The current cooling coil, originally rated at 5.2 kW, has been in operation for 22 years and is likely performing below its original design capacity. Industry benchmarks indicate that cooling coils in service for two decades typically experience a 20% to 40% decline in performance. This degradation is primarily due to factors such as fin surface fouling, internal corrosion, and reduced airflow—issues that are often exacerbated in coastal locations like Cork Harbour, where salt-laden air accelerates material wear.

Under normal operating conditions, the effective cooling output of this coil is now estimated to be approximately 3.6 kW.

Given that the expected service life of a cooling coil is generally 15 to 20 years, this unit has surpassed its typical operational lifespan. Replacement should be strongly considered. Installing a new coil would not only restore full cooling capacity but could also improve thermal efficiency, reduce pressure losses, and lower overall energy consumption—representing a sound investment in performance, reliability, and regulatory compliance.

Heating Coil:

Next up we have the heating coil, with very brittle fins. Again as the cooling coil: The existing heating coil, rated at 9.6 kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 6.72 kW of effective heating.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Humidifier:

The humidifier was found to be isolated and effectively redundant at the time of our survey. This may be due to a combination of factors, including operating costs, maintenance burdens, health and safety risks, and the adoption of modern ventilation strategies that reduce the need for active humidification.

Note; In temperate maritime climates like Ireland, indoor humidity levels often remain within acceptable ranges without intervention. Historically, some manufacturers—such as Fläkt—routinely included humidifiers as standard components, often as a sales-driven upsell, even where humidity control was not operationally essential. In practice, humidification is only critical in specific environments such as hospitals, clean rooms, data centres, museums, and pharmaceutical or precision manufacturing facilities.

That said, it is important to note that this humidifier is positioned downstream of the heating coil, where relative humidity naturally drops as air is warmed. Therefore, a more detailed assessment is recommended to determine whether the humidifier was ever functionally required, or if its redundancy has had any unintended impact on indoor air quality or comfort.

Bag Filters

Next in the system is 1x1/1 F7 (EU7) bag filters. The filter and filter frame appear to be in generally ok condition, requiring minor rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Given that the AHU operates at 0.61m³/s @ 300Pa, there are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven fan assembly and 1.1 kW motor, installed in 2003, have now exceeded 22 years of service—well beyond the expected operational lifespan for these components. At this stage, performance degradation and increased maintenance demands are highly likely.

We recommend replacing the current setup with modern EC (electronically commutated) fan technology. EC fans provide several key advantages: enhanced energy efficiency, integrated variable-speed control, and the elimination of belt-related energy losses. This allows for more accurate airflow regulation and reduced power consumption, while also eliminating the ongoing maintenance burden associated with belts, pulleys, and associated mechanical wear.

Although the current 1.1 kW motor size suggests that immediate energy savings may be modest, the long-term benefits are substantial. Transitioning to EC fans will restore optimal airflow performance, improve system reliability, and reduce routine maintenance tasks such as belt replacement and alignment. These changes translate into lower operational costs, fewer unplanned outages, and a more sustainable, cost-effective ventilation system over the equipment’s lifecycle.

Investment in EC fan technology therefore represents a future-proof solution aligned with best practice, delivering both performance and financial returns over time.

Panel Filter Wall:

Going back through exhaust section, and after the heat exchanger that was covered earlier in this document, we have another panel filter wall. This section contains:

1x 1/1 G3 filters

The filters are rated for an initial pressure drop of 34 Pa, with a recommended final pressure drop of 104Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition. Higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance

Exhaust Fan Section

This fan unit, functionally similar to the supply fan, is equipped with a 0.75 kW belt-driven motor installed in 2003—now over 22 years in service and well beyond the typical lifespan expected for such mechanical components. At this age, diminished performance and increased maintenance needs are common.

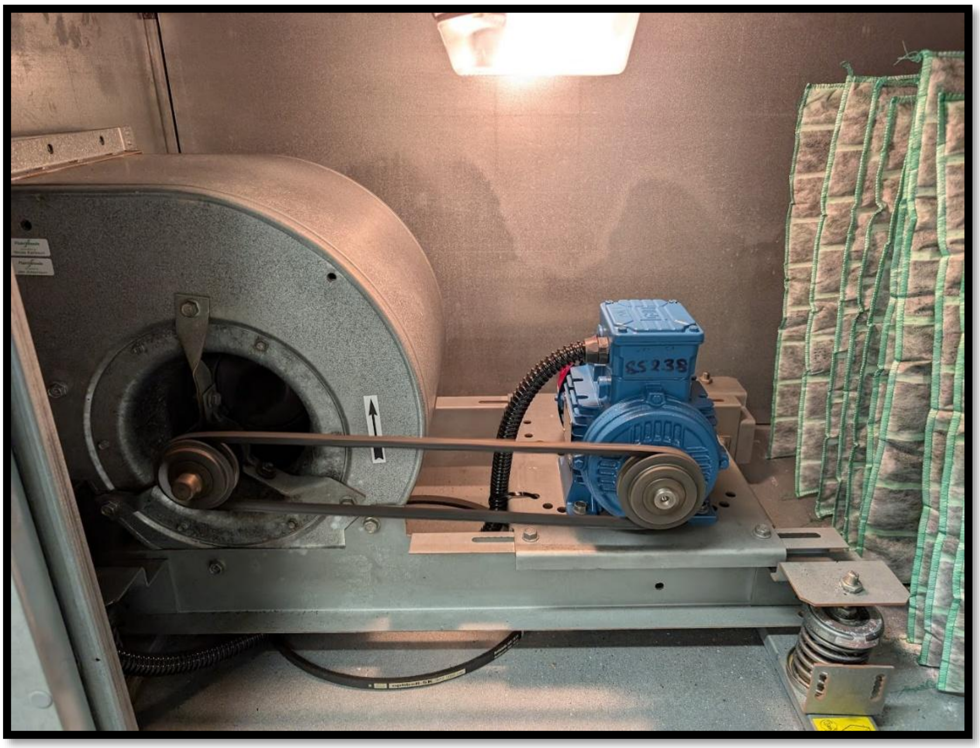
We recommend replacing the existing system with EC (electronically commutated) fan technology. EC fans provide enhanced energy efficiency, integrated variable-speed capability, and eliminate the mechanical losses associated with belt-driven systems. This results in more accurate airflow control and reduced power consumption, while removing the need for ongoing belt maintenance.

Although the current motor's relatively low power rating (0.75 kW) suggests that immediate energy savings may be limited, the long-term operational and financial benefits are significant. Upgrading to EC fans will restore optimal airflow performance, increase system reliability, and reduce maintenance overhead by eliminating components such as belts and pulleys that require regular inspection and replacement.

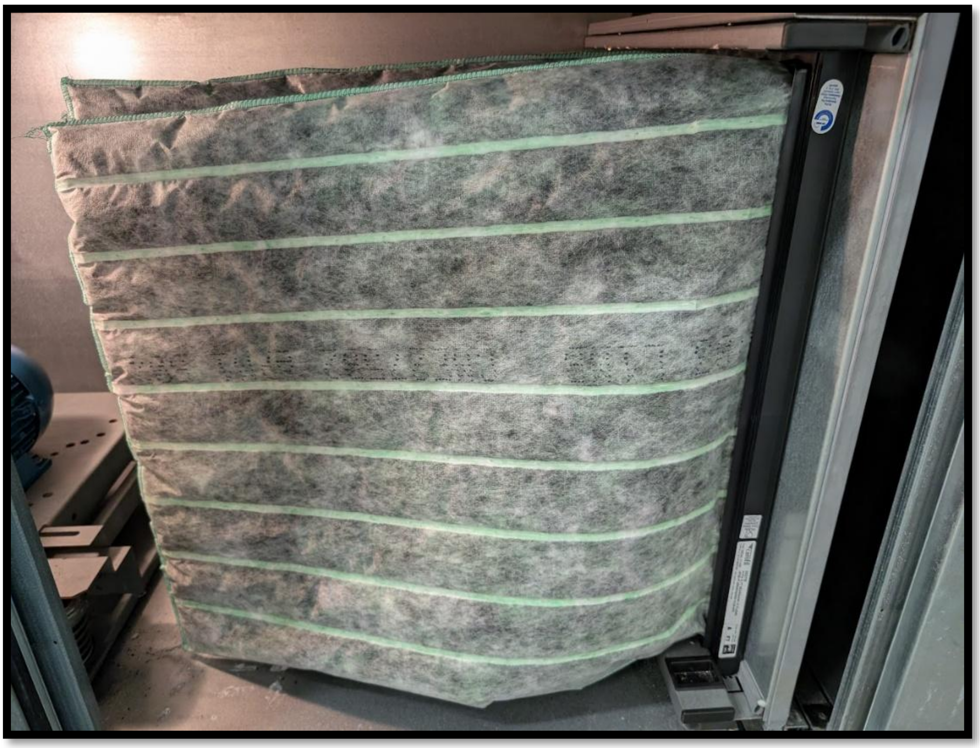
Over time, this retrofit will reduce system downtime, improve energy performance, and lower total cost of ownership—making it a forward-looking investment that aligns with best practice in HVAC system management and operational efficiency.

Photos

AHU01 - 360 Simulator



Supply Fan Section



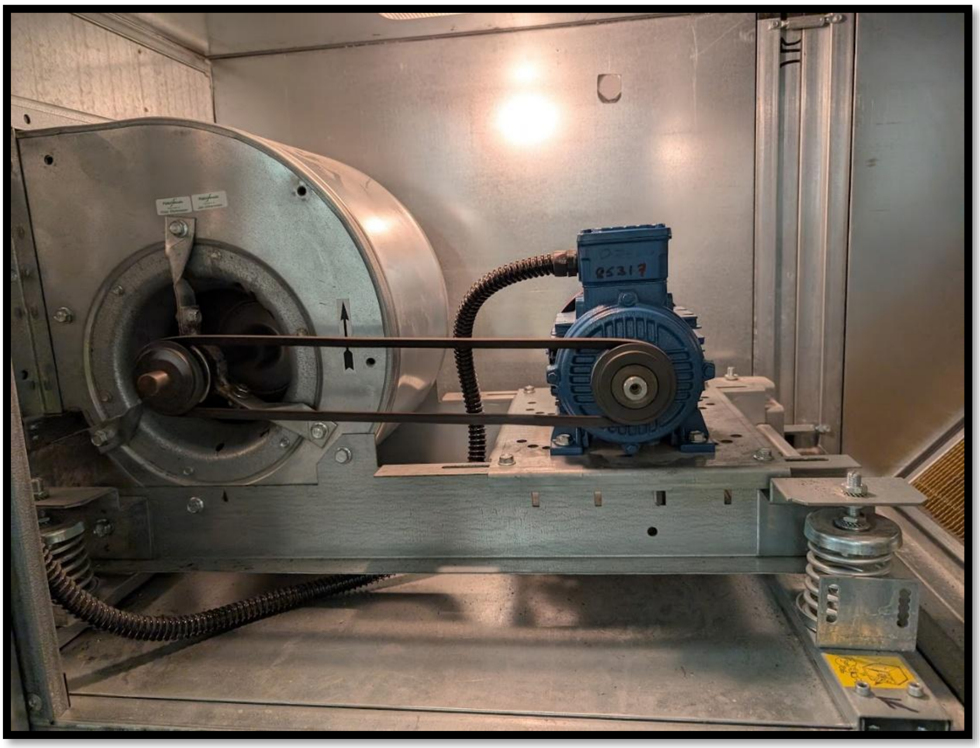
Supply Fan Section Bag Filters

Humidifier Section

Heat Exchanger

Electric Pre Heat

Supply panel filter section



Exhaust Fan Section

Exhaust heat exchanger section

Exhaust filters

Redundant humidifier

Conclusion

AHU01 - 360 Simulator

- 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.

A detailed condition assessment of the AHU01-360 Simulator, manufactured by Fläkt and in operation for over 22 years, has been completed in line with CIBSE, RICS, and BESA guidance. The unit has exceeded its expected economic service life as defined in CIBSE Guide M, with key findings based on best-practice engineering survey methods and asset grading standards.

While the AHU remains structurally sound and broadly functional, critical components—including the heating and cooling coils, belt-driven fans, electric heater battery, and heat exchanger—are exhibiting age-related deterioration. These elements fall short of current requirements under EU Ecodesign (EU 2016/2281) and Irish Building Regulations (Part L and Part F), resulting in subpar energy efficiency, airflow performance, and filtration effectiveness.

From a Public Spending Code and OPW Governance Framework perspective, ongoing operation of legacy components is no longer cost-effective. A life cycle cost analysis supports a targeted refurbishment strategy over full unit replacement. Recommended upgrades include EC fan retrofits, coil replacements, and filter enhancements. These measures will restore system performance, improve energy efficiency, reduce maintenance costs, and ensure long-term compliance.

Conclusion: AHU01-360 is a strong candidate for selective refurbishment. Strategic upgrades will extend asset life, improve operational performance, and deliver better value over time—fully aligned with regulatory, financial, and sustainability goals.

Recommendations

AHU01 - 360 Simulator

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.
- Apply corrosion-resistant coatings where rust is present.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Possible damper and actuator replacement required.
- Install access panels for ongoing maintenance and inspection.

Electric Heater Battery

- Replace the EHB with a modern, energy-efficient equivalent.
- Reconfigure panel layout to provide ≥300 mm clearance from filters, as per best practice.
- Install non-combustible filters or thermal protection if clearance cannot be achieved.

Panel Filter Wall

- Treat rust on filter frames or replace affected sections.
- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Bag Filters

- Upgrade existing F7 (EU7) bag filters to ISO ePM1 60% advanced synthetic filters with:
  - Lower pressure drop
  - Extended service life
  - Eurovent A+ energy efficiency rating

Plate Heat Exchanger

- Replace with a modern unit achieving ≥75% efficiency to comply with EU Ecodesign Regulation.
- Include integral damper replacement.

Cooling Coil

- Replace 5.2kW coil due to 20–40% performance degradation from age and corrosion.
- A new coil will restore full cooling capacity and improve energy performance.

Heating Coil

- Replace 9.6 kW coil showing fin brittleness and capacity loss.
- Upgrade to reduce energy use and maintain heating reliability.

Humidifier

- Conduct an assessment to determine whether reactivation or full removal is appropriate.
- Consider removing if not required for indoor air quality or process humidity control.

Supply Fan & Motor

- Replace the belt-driven 1.1 kW fan/motor with an EC fan:
  - Improves efficiency
  - Eliminates belt losses
  - Enables precise airflow control
  - Reduces maintenance costs

Exhaust Fan & Motor

- Retrofit the 0.75kW exhaust fan with an EC fan system for the same benefits listed above.

Exhaust Panel Filters

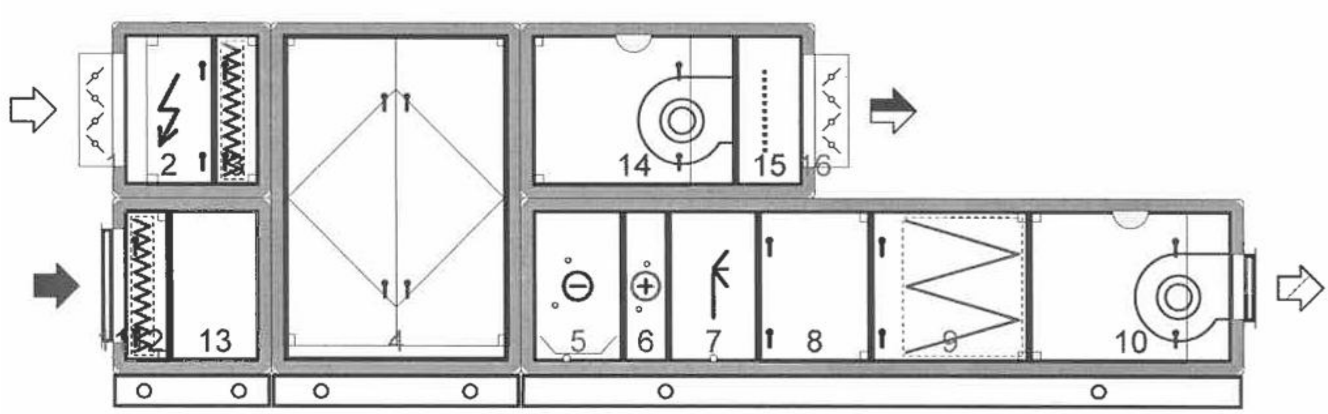
- Treat or replace corroded frames.
- Consider upgrading to low-resistance G4 or ePM10 filters for energy savings.

Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

Condition

AHU02 – 270 Simulator

AHU drawing



Unit Overview:

This AHU, manufactured by Fläkt approximately 22 years ago, is installed within an internal plantroom located on an upper level. It was originally specified to deliver 6.1 m^3/s at 300 Pa for supply air and 0.61 m^3/s at 300 Pa for exhaust air.

The unit includes a fresh air intake damper, electric frost coil, panel and bag filters, two belt-driven fans with associated motors, heating and cooling coils, and a heat exchanger. A humidifier is also present but has been disconnected and is currently non-operational. Externally, the AHU appears to be in good condition, with no visible evidence of significant repairs or retrofits to any section.

Aside from the airflow direction—left to right as opposed to right to left—this AHU is identical in design and specification to AHU01-360 Simulator.

Intake Section:

Immediately downstream of the intake duct is an empty section with no provision for maintenance access. As this is the first contact point for incoming supply air—exposed to salt-laden air from nearby Cork Harbour—there is a significant risk of debris accumulation and corrosion. We recommend a detailed intrusive inspection of this area, followed by retrofitting appropriate access and inspection panels to facilitate ongoing maintenance.

Intake Dampers:

Downstream of the intake duct are the intake dampers. The Actuator for this damper is missing and has been removed from the AHU for an unknown reason.

As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The Dampers appeared to function correctly during local isolation and when switching on the fans.

Electric Heater Battery (EHB):

Going from intake to discharge, next is the electric heater battery (EHB). It is designed to raise incoming air from -3 °C to 7.8 °C, providing frost protection for all downstream components. It delivers a total heating capacity of 8kW. While this may appear modest, it is appropriately sized given the average winter temperatures at Cork Harbour, which range from 8 °C to 10 °C during the day and 2 °C to 5 °C at night (December to February). Frost occurrence is infrequent due to the coastal influence of the nearby Atlantic Ocean.

Concerningly the EHB is currently installed with only 150 mm clearance from cardboard panel filters.

While there is no specific Irish regulation mandating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidance generally recommend a minimum clearance of 300 mm.

This spacing is essential to:

- Prevent filter overheating
- Reduce fire risk, especially with synthetic or combustible media
- Ensure uniform airflow and prevent hot spots that could damage components

Additional Best Practices:

- Where reduced spacing is unavoidable, use non-combustible or metal-framed filters
- Include airflow interlocks and high-temperature cut-outs for safety

We recommend replacing the existing EHB and repositioning the panel work to provide a clearance exceeding 300 mm, ensuring full compliance with international fire safety and operational efficiency standards. Furthermore, we advise upgrading to a modern, energy-efficient EHB capable of delivering the same heating output with lower power consumption, thereby improving system performance and reducing operational costs.

Panel Filter Wall:

This section contains:

- 1x 1/1 G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 34 Pa, with a recommended final pressure drop of 104 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

There did not appear to be any signs of major rust or corrosion. Higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 9.3 °C, and an exhaust air range of 21 °C down to 8.7 °C. It provides 9.1 kW of heat recovery, equating to a thermal efficiency of 51.4%.

While the unit appears to be in good physical condition, the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m^3/h—this unit operates at approximately 2,196 m^3/h, well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Cooling coil:

The existing cooling coil, rated at 5.2 kW, is now 22 years old and likely operating well below its original design capacity. Industry data suggests that after two decades, cooling coils typically experience a 20% to 40% reduction in performance due to factors such as fin surface fouling, internal corrosion, and reduced airflow—especially in coastal environments like Cork Harbour where salt-laden air accelerates degradation.

For this coil, the effective cooling output may now be closer to 3.6kW under typical conditions.

Given that the typical lifespan of a cooling coil is 15–20 years, and this unit has exceeded that range, replacement should be seriously considered. A new coil would not only restore full capacity but also offer improved efficiency, potentially lower pressure drops, and reduced energy consumption—making it a worthwhile investment in both performance and compliance.

Heating Coil:

Next up we have the heating coil, with very brittle fins. Again as the cooling coil: The existing heating coil, rated at 9.6 kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 6.72 kW of effective heating.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Humidifier:

The humidifier was found to be isolated and effectively redundant at the time of our survey. This may be due to a combination of factors, including operating costs, maintenance burdens, health and safety risks, and the adoption of modern ventilation strategies that reduce the need for active humidification.

Note; In temperate maritime climates like Ireland, indoor humidity levels often remain within acceptable ranges without intervention. Historically, some manufacturers—such as Fläkt—routinely included humidifiers as standard components, often as a sales-driven upsell, even where humidity control was not operationally essential. In practice, humidification is only critical in specific environments such as hospitals, clean rooms, data centres, museums, and pharmaceutical or precision manufacturing facilities.

That said, it is important to note that this humidifier is positioned downstream of the heating coil, where relative humidity naturally drops as air is warmed. Therefore, a more detailed assessment is recommended to determine whether the humidifier was ever functionally required, or if its redundancy has had any unintended impact on indoor air quality or comfort.

Bag Filters

Next in the system is 1x1/1 F7 (EU7) bag filters. The filter and filter frame appear to be in generally ok condition, requiring minor rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Given that the AHU operates at 0.61m³/s @ 300Pa, there are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven fan assembly, powered by a 1.1 kW motor manufactured in 2003, has now been in continuous service for over 22 years—well beyond the typical operational lifespan for components of this type. At this stage, reduced performance, increased energy consumption, and higher maintenance demands are to be expected.

To address these issues, it is recommended that the system be retrofitted with modern EC (electronically commutated) fan technology. EC fans provide notable advantages, including integrated variable-speed control, superior energy efficiency, and the elimination of mechanical belt losses. These features allow for more accurate airflow regulation and significantly lower power usage.

While the existing motor’s 1.1 kW rating suggests that short-term energy savings may be modest, the long-term value proposition is clear. Upgrading to EC fans removes all belt-driven components, eliminating the need for regular belt replacements, pulley alignment, and associated labour costs. This results in reduced system downtime, improved reliability, and lower lifecycle maintenance expenditure.

Overall, transitioning to EC technology represents a cost-effective investment that enhances system performance, supports compliance with energy efficiency objectives, and reduces the total cost of ownership over the lifespan of the asset.

Panel Filter Wall:

Going back through exhaust section, and after the heat exchanger that was covered earlier in this document, we have another panel filter wall. This section contains:

1x 1/1 G3 filters

The filters are rated for an initial pressure drop of 34 Pa, with a recommended final pressure drop of 104Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition. Higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance

Exhaust Fan Section

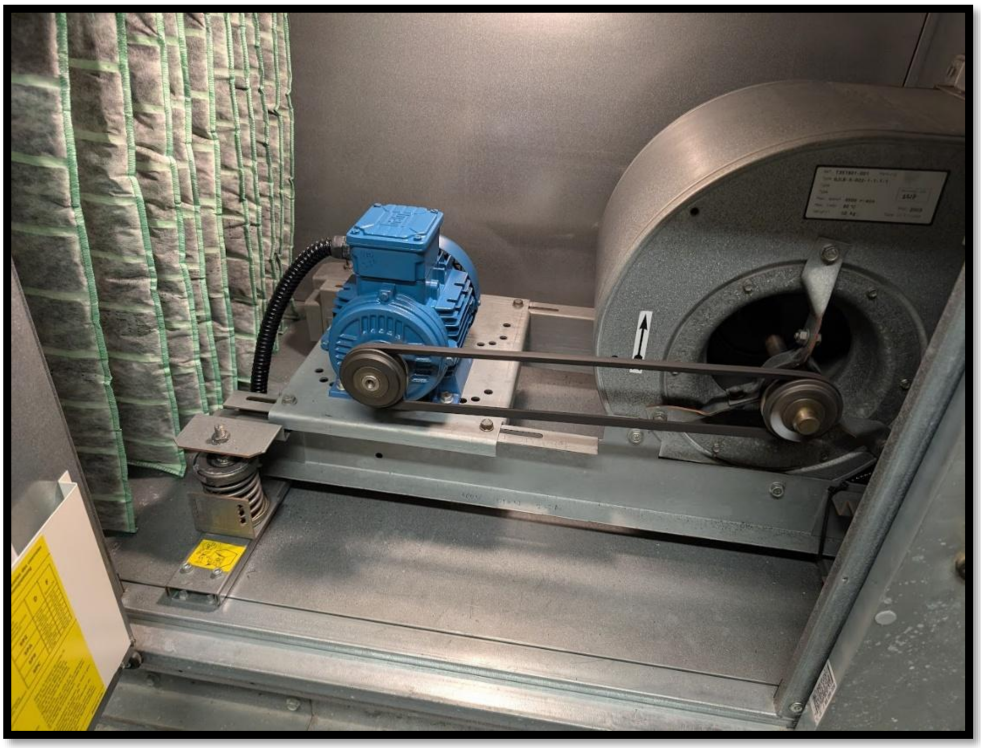
Almost identical to the supply fan, this fan instead has a motor of 0.75 kW motor, manufactured in 2003 is also over 22 years old—well beyond the typical service life expectancy for such components.

Given the age of the equipment, we recommend retrofitting the system with EC (electronically commutated) fans. EC fans offer superior energy efficiency, variable-speed control, and eliminate belt losses entirely, providing more precise airflow management and significantly lower power consumption.

This upgrade would restore full airflow performance, enhance system reliability, and significantly reduce ongoing maintenance demands. While the existing motor's kW rating means the switch to EC technology may not yield substantial immediate energy savings, the long-term operational benefits are considerable. Transitioning to EC fans eliminates all belt-driven components—removing the need for frequent belt replacements, pulley alignments, and associated labour costs. Over time, this results in improved efficiency, reduced downtime, and a lower total cost of ownership.

Photos

AHU02 – 270 Simulator



Supply Fan Section

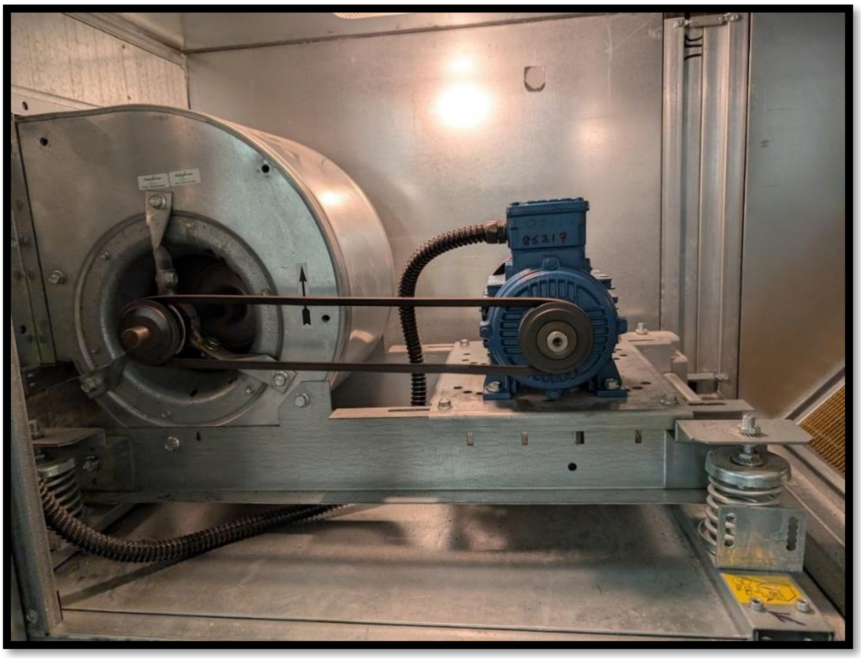
Supply Fan Section Bag Filters

Missing Actuator on Intake Dampers

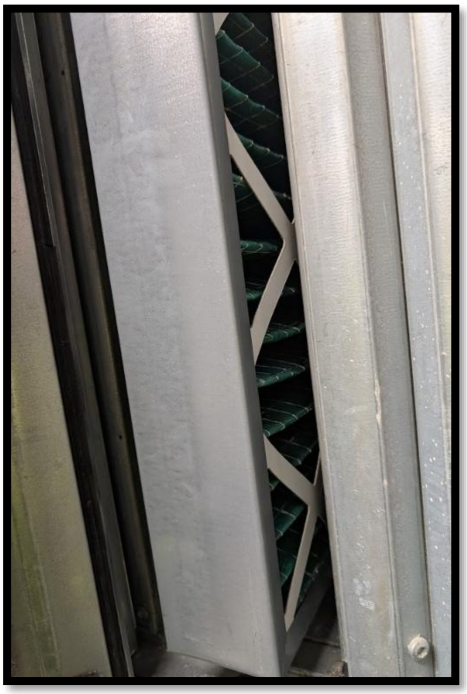
Heat Exchanger

Electric Pre Heat

Supply Panel Filter Section



Exhaust Fan Section



Exhaust Filters

Redundant Humidifier

Conclusion

AHU02 – 270 Simulator

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Although the AHU remains structurally serviceable, and in good condition multiple components—including the cooling and heating coils, belt-driven fans, electric heater battery, and plate heat exchanger—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU02-270 Simulator is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU02 – 270 Simulator

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.
- Apply corrosion-resistant coatings where rust is present.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Possible damper and actuator replacement required. New actuator required.
- Install access panels for ongoing maintenance and inspection.

Electric Heater Battery

- Replace the EHB with a modern, energy-efficient equivalent.
- Reconfigure panel layout to provide ≥300 mm clearance from filters, as per best practice.
- Install non-combustible filters or thermal protection if clearance cannot be achieved.

Panel Filter Wall

- Treat rust on filter frames or replace affected sections.
- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Bag Filters

- Upgrade existing F7 (EU7) bag filters to ISO ePM1 60% advanced synthetic filters with:
  - Lower pressure drop
  - Extended service life
  - Eurovent A+ energy efficiency rating

Plate Heat Exchanger

- Replace with a modern unit achieving ≥75% efficiency to comply with EU Ecodesign Regulation.
- Include integral damper replacement.

Cooling Coil

- Replace 5.2kW coil due to 20–40% performance degradation from age and corrosion.
- A new coil will restore full cooling capacity and improve energy performance.

Heating Coil

- Replace 9.6 kW coil showing fin brittleness and capacity loss.
- Upgrade to reduce energy use and maintain heating reliability.

Humidifier

- Conduct an assessment to determine whether reactivation or full removal is appropriate.
- Consider removing if not required for indoor air quality or process humidity control.

Supply Fan & Motor

- Replace the belt-driven 1.1 kW fan/motor with an EC fan:
  - Improves efficiency
  - Eliminates belt losses
  - Enables precise airflow control
  - Reduces maintenance costs

Exhaust Fan & Motor

- Retrofit the 0.75kW exhaust fan with an EC fan system for the same benefits listed above.

Exhaust Panel Filters

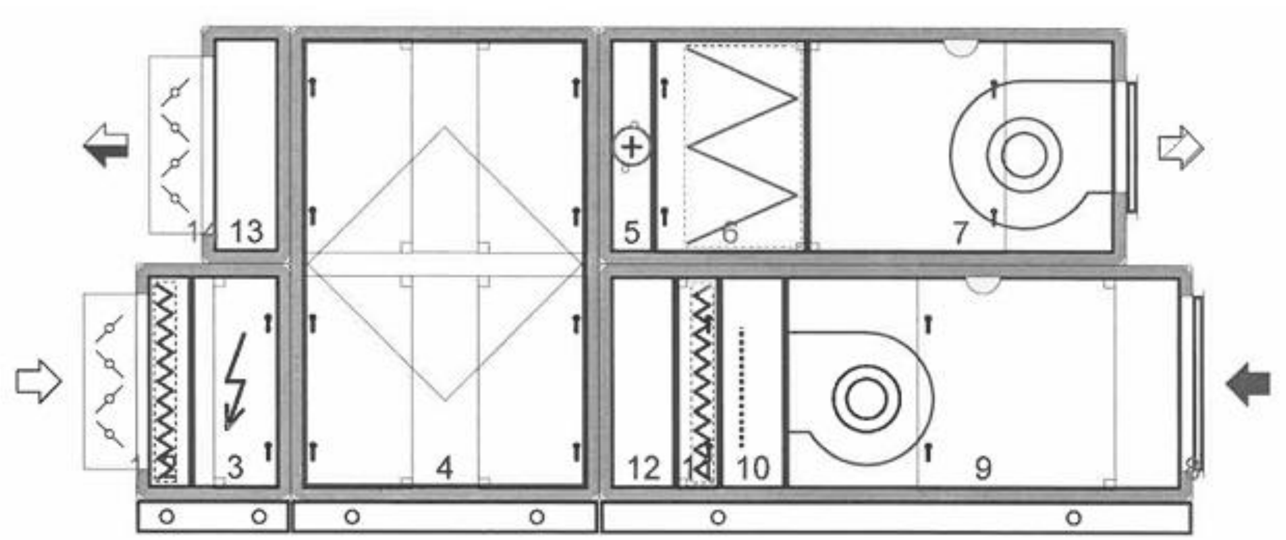
- Treat or replace corroded frames.
- Consider upgrading to low-resistance G4 or ePM10 filters for energy savings.

Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

Condition

AHU09 – Block B Toilets

AHU drawing



Unit Overview:

This AHU, manufactured by Flakt approximately 22 years ago, is located internally within an upper level internal plantroom and was originally designed to achieve 2.90m³/s @ 300Pa for Supply Air and 2.90m³/s @ 300Pa for Exhaust Air.

The AHU offers heating only, consists of a fresh air inlet damper, electric frost coil, panel and bag filters, two belt driven fan and motors, Heating and Heat Exchanger. Externally the unit appears to be in good condition. There doesn't appear to have been any major repairs or retrofits along any section.

Intake Section:

Immediately downstream of the intake duct is an empty section with no provision for maintenance access. As this is the first contact point for incoming supply air—exposed to salt-laden air from nearby Cork Harbour—there is a significant risk of debris accumulation and corrosion. We recommend a detailed intrusive inspection of this area. Following inspection, appropriate access and inspection panels should be retrofitted to ensure safe and effective ongoing maintenance, reduce long-term risk of degradation, and support continued system reliability.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The Dampers appeared to function correctly during local isolation and when switching on the fans.

Electric Heater Battery (EHB):

Going from intake to discharge, next is the electric heater battery (EHB). It is designed to raise incoming air from -3 °C to 3.8 °C, providing frost protection for all downstream components. It delivers a total heating capacity of 24kW. While this may appear modest, it is appropriately sized given the average winter temperatures at Cork Harbour, which range from 8 °C to 10 °C during the day and 2 °C to 5 °C at night (December to February). Frost occurrence is infrequent due to the coastal influence of the nearby Atlantic Ocean.

Concerningly the EHB is currently installed with only 150 mm clearance from cardboard panel filters.

While there is no specific Irish regulation mandating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidance generally recommend a minimum clearance of 300 mm.

This spacing is essential to:

- Prevent filter overheating
- Reduce fire risk, especially with synthetic or combustible media
- Ensure uniform airflow and prevent hot spots that could damage components

Additional Best Practices:

- Where reduced spacing is unavoidable, use non-combustible or metal-framed filters
- Include airflow interlocks and high-temperature cut-outs for safety

We recommend replacing the existing EHB and repositioning the panel work to provide a clearance exceeding 300 mm, ensuring full compliance with international fire safety and operational efficiency standards. Furthermore, we advise upgrading to a modern, energy-efficient EHB capable of delivering the same heating output with lower power consumption, thereby improving system performance and reducing operational costs.

Panel Filter Wall:

This section contains:

- 2x 1/1 G3 filters
- 2x ½ G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 60Pa, with a recommended final pressure drop of 130 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 10.2 °C, and an exhaust air range of 21 °C down to 9.8 °C. It provides 46.4 kW of heat recovery, equating to a thermal efficiency of 52.3%.

While the unit appears to be in good physical condition, the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m^3/h—this unit operates at approximately 10,440 m^3/h, well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Heating Coil:

The next component in the system is the heating coil, which exhibits brittle fin surfaces indicative of age-related wear. Originally rated at 45.6 kW, the coil has been in service for 22 years and has likely experienced significant degradation in output capacity. Industry data suggests that heating coils commonly suffer a 20% to 40% reduction in performance over time due to internal corrosion (particularly in water-based systems), scale accumulation, fin fouling, and reduced airflow. In coastal environments such as Cork Harbour, the presence of salt-laden air can further accelerate corrosion and exacerbate performance loss.

Based on these factors, the coil's effective output is now estimated at approximately 31.9 kW under typical conditions.

Given that the expected operational lifespan for heating coils is 15 to 20 years, this unit has exceeded its serviceable life. We recommend full replacement of the heating coil to restore original thermal capacity, enhance energy efficiency, and reduce the risk of failure during periods of high heating demand.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. Both the filters and their frames appear to be in generally ok condition, requiring minor rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Given that the AHU operates at 2.90 m^3/s with 300 Pa available pressure, there are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven fan assembly, powered by two 5.5 kW motors installed in 2003, has been in continuous operation for over 22 years—well beyond the typical service life of such mechanical systems. Originally designed to deliver 300 Pa of external static pressure, current measurements indicate the system is only achieving 208 Pa, representing a 33% decline in performance. Despite this reduced output, the motors are likely still drawing close to their full rated power, resulting in inefficient operation.

This underperformance can be attributed to mechanical degradation over time, including wear in belts, pulleys, bearings, and impellers. These issues contribute to slippage, vibration, and reduced fan speed—collectively lowering airflow efficiency and increasing energy waste.

Recommendation: Given the extent of efficiency loss and the advanced age of the equipment, we recommend retrofitting the fan system with high-efficiency EC (electronically commutated) fans. EC fans eliminate belt-driven components entirely, offer precise variable-speed control, and provide significantly improved energy efficiency.

Benefits of the Upgrade Include:

- Restoration of full airflow and pressure performance
- Enhanced system reliability and control
- Elimination of ongoing belt and mechanical maintenance
- Reduced electrical consumption and long-term operational cost savings

This upgrade represents a future-proof investment that addresses both performance shortfalls and energy inefficiencies, while aligning with sustainability goals and lifecycle asset management best practices.

Exhaust Fan Section

Almost identical to the supply fan, this fan instead has 2 x motors of 5.3 kW motor, manufactured in 2003 is also over 22 years old—well beyond the typical service life expectancy for such components.

These systems were originally designed to deliver 300 Pa of external static pressure, yet current measurements indicate only around 208 Pa is being achieved. A 30.7% drop in extract fan pressure performance compared to design specification, while the motor likely continues to draw near its full rated power.

As a result, the system is operating inefficiently, with a significant portion of the electrical input lost due to mechanical wear and reduced airflow output. Degradation in components such as belts, pulleys, bearings, and impellers over time leads to slippage, vibration, and loss of fan speed—all contributing to reduced system performance.

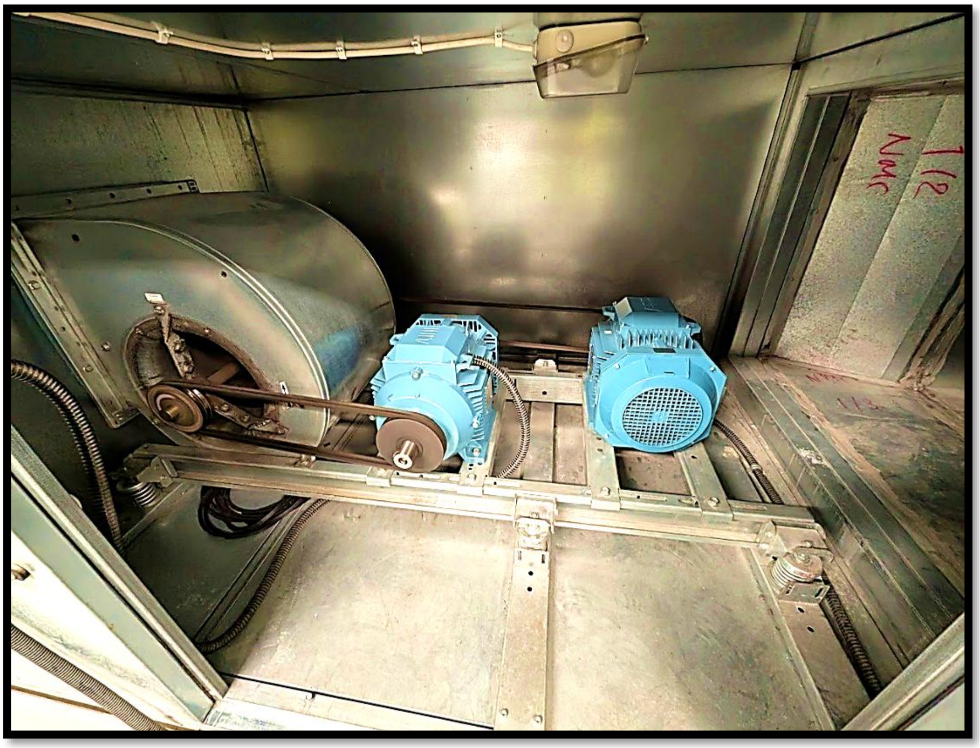
Given this level of underperformance and the age of the equipment, we recommend retrofitting the system with EC (electronically commutated) fans as soon as possible. EC fans offer superior energy efficiency, variable-speed control, and eliminate belt losses entirely, providing more precise airflow management and significantly lower power consumption.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Photos

AHU09 – Block B Toilets

Under Duty Airflow Readings.



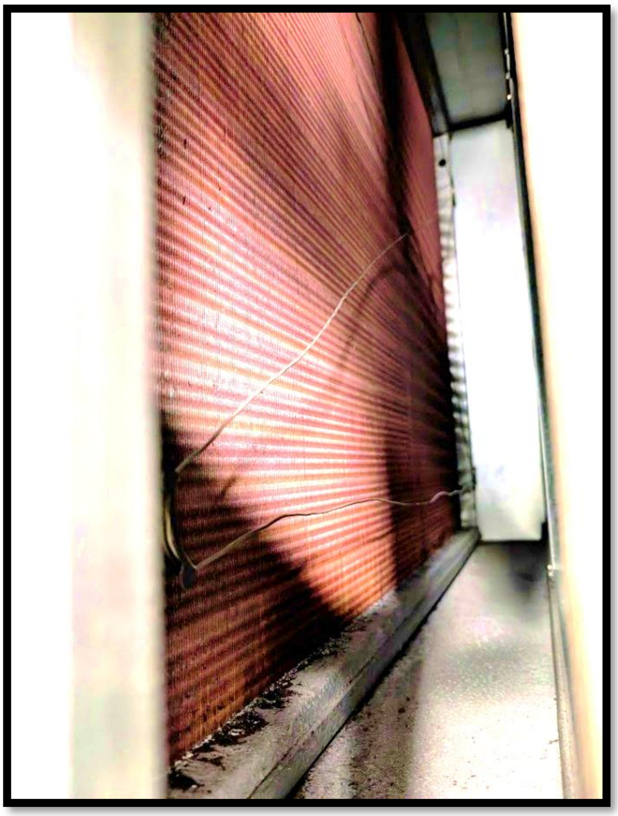
Supply Fan Section

Minor Rust and Debris

Electric Heater Battery Corroded and Located 150mm From Panel Filters.

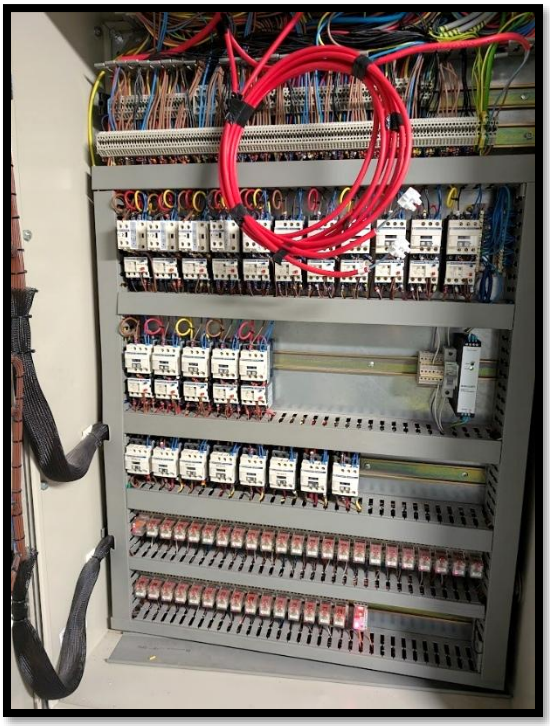
(This applies to all AHUs)

Heater Battery section


Brittle Corroded Heating Coil

Exhaust Damper Actuator

Control Panel



The current **BMS panel** does not appear to support fan speed modulation based on key parameters such as temperature, CO_2 levels, airflow and other set points.

We recommend a detailed BMS survey be undertaken to assess upgrade potential. Significant energy savings and operational efficiencies could be achieved through the integration of intelligent control strategies, including demand-based ventilation and control.

Conclusion

AHU09- Block B Toilets

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Although the AHU remains structurally serviceable, multiple components—including the heating coils, belt-driven fans, electric heater battery, and plate heat exchanger—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

AHU09 is a strong candidate for strategic refurbishment rather than decommissioning. Through the replacement of degraded components and integration of modern, high-efficiency systems, the unit can be restored to optimal performance—surpassing its original design standards—while reducing energy consumption, extending asset life, and aligning with both regulatory and fiscal best practices.

Recommendations

AHU09 – Block B Toilets

By upgrading ageing components—most of which have exceeded their expected operational lifespan of over 22 years—and addressing specific issues through targeted remedial actions rather than full system replacement, overall system efficiency can be restored, reliability improved, and regulatory compliance achieved, while maximising the value of the existing infrastructure investment.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.
- Apply corrosion-resistant coatings where rust is present.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Possible damper and actuator replacement required.
- Install access panels for ongoing maintenance and inspection.

Electric Heater Battery

- Replace the EHB with a modern, energy-efficient equivalent.
- Reconfigure panel layout to provide ≥300 mm clearance from filters, as per best practice.
- Install non-combustible filters or thermal protection if clearance cannot be achieved.

Panel Filter Wall

- Treat rust on filter frames or replace affected sections.
- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Bag Filters

- Upgrade existing F7 (EU7) bag filters to ISO ePM1 60% advanced synthetic filters with:
    - Lower pressure drop
    - Extended service life
    - Eurovent A+ energy efficiency rating

Plate Heat Exchanger

- Replace with a modern unit achieving ≥75% efficiency to comply with EU Ecodesign Regulation.
- Include integral damper replacement.

Heating Coil

- Replace 52.2 kW coil showing fin brittleness and capacity loss.
- Upgrade to reduce energy use and maintain heating reliability.

Supply Fan & Motor

- Replace the belt-driven fan/motor with an EC fan:
  - Improves efficiency
  - Eliminates belt losses
  - Enables precise airflow control
  - ROI estimated at ~2.2 years

Exhaust Fan & Motor

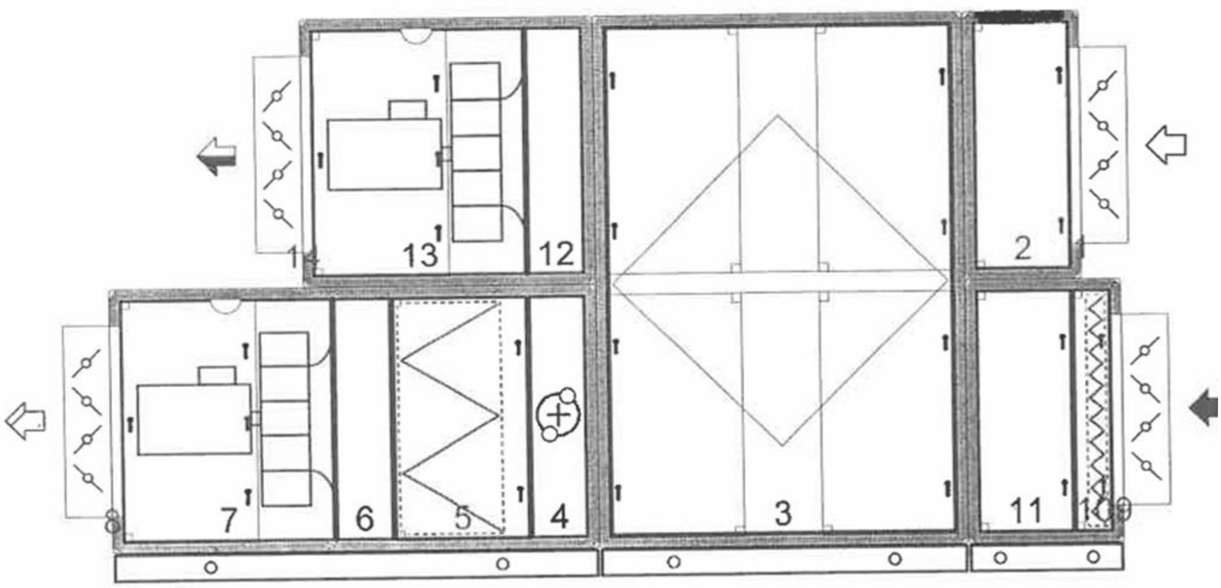
- Retrofit the exhaust fan with an EC fan system for the same benefits listed above.

Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

Condition

AHU06 – Pool Hall

AHU drawing



Unit Overview:

This AHU, manufactured by Flakt approximately 22 years ago, is located internally within an internal plantroom and was originally designed to achieve 4.25m³/s @ 300Pa for Supply Air and 4.25m³/s @ 300Pa for Exhaust Air. This unit was non-operational at the time of the survey and is understood to be used only during specific tests conducted in the pool at certain times of the year.

The AHU consists of a fresh air inlet damper, panel and bag filters, two plug fans with integral motors, Heating coil and Heat Exchanger. Externally the unit appears to be in good condition. There doesn't appear to have been any major repairs or retrofits along any section.

Generally throughout the unit shows signs of corrosion and rusting with debris build up.

Intake Section:

Immediately downstream of the intake duct is an empty section with no provision for maintenance access. As this is the first contact point for incoming supply air—exposed to salt-laden air from nearby Cork Harbour—there is a significant debris accumulation and corrosion. We recommend a detailed intrusive inspection of this area, followed by retrofitting appropriate access and inspection panels to facilitate ongoing maintenance.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 10.8 °C, and an exhaust air range of 21 °C down to 10.1 °C. It provides 70.7 kW of heat recovery, equating to a thermal efficiency of 57.3%.

While the unit appears to be in good physical condition, the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m³/h—this unit operates at approximately 15,300 m³/h, well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Heating Coil:

Next up we have the heating coil, with very brittle fins and rust throughout. The existing heating coil, rated at 112.8 kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 85kW of effective heating.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. Both the filters and their frames appear to be showing signs of corrosion throughout, requiring rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Given that the AHU operates at 4.25m^3/s with 300 Pa available pressure, there are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing plug fan, manufactured in 2003, has now exceeded 22 years of service—well beyond the typical operational lifespan for this type of equipment. Fan speed is currently controlled by an adjacent inverter via frequency (Hz) input signals.

During the recent survey, the fans could not be powered up for operational testing. However, visual inspection revealed significant corrosion within the fan impeller, indicating advanced deterioration.

This level of mechanical wear is likely contributing to reduced airflow performance and inefficient energy use, with a considerable portion of electrical input being lost due to internal resistance and compromised aerodynamic function.

Given the age and visible degradation of the fan assembly, we recommend replacing the existing unit with corrosion-protected EC (electronically commutated) fan technology. EC fans offer integrated variable-speed control, eliminate belt-related energy losses, and provide significantly improved energy efficiency and airflow precision.

Implementing this upgrade will restore full performance capability, enhance system reliability, reduce maintenance demands, and deliver long-term reductions in energy consumption and operating costs—representing a cost-effective, future-proof solution aligned with asset management best practices.

Panel Filter Wall:

This section contains:

- 4x 1/1 G3 filters
- 2x ½ G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 52Pa, with a recommended final pressure drop of 122Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Exhaust Fan Section

This extract fan, manufactured in 2003, is nearly identical in configuration to the adjacent supply fan and has also exceeded 22 years of continuous operation—well beyond the typical service life for fan assemblies of this type. Visual inspection during the survey revealed clear signs of corrosion and physical deterioration, particularly on the impeller and casing surfaces, indicating long-term exposure to moisture-laden or potentially corrosive airflows.

Fan speed is currently controlled via an adjacent inverter using frequency (Hz) input signals. While this setup allows for some modulation, the inherent inefficiencies of a belt-driven system—especially one in a degraded condition—result in significant mechanical and energy losses. The system is now likely drawing close to its full electrical input while delivering suboptimal airflow, further exacerbating energy waste and reducing overall system performance.

Recommendation: Given the observed deterioration and outdated configuration, we strongly recommend retrofitting the extract fan system with modern EC (electronically commutated) fan technology. EC fans provide integrated variable-speed control, eliminate all belt-driven components, and are designed for high-efficiency operation across a range of airflow demands.

Technical and Operational Advantages:

- Elimination of belt losses and associated mechanical inefficiencies
- Improved airflow precision and system balancing through onboard speed control
- Reduced maintenance burden by removing belts, pulleys, and related wear points
- Corrosion-resistant options available to address environmental exposure risks
- Lower power consumption, especially during part-load operation

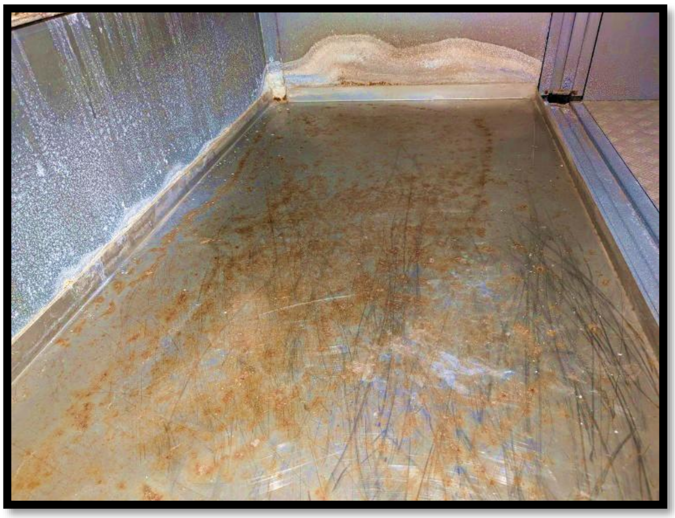
Upgrading to EC fans offers a high return on investment through reduced energy use, improved reliability, and lower lifecycle maintenance costs. The transition to direct-drive, electronically controlled fan systems aligns with modern energy efficiency standards, supports regulatory compliance, and contributes to long-term operational savings. This retrofit is a practical, cost-effective intervention that addresses current performance issues while future-proofing the system.

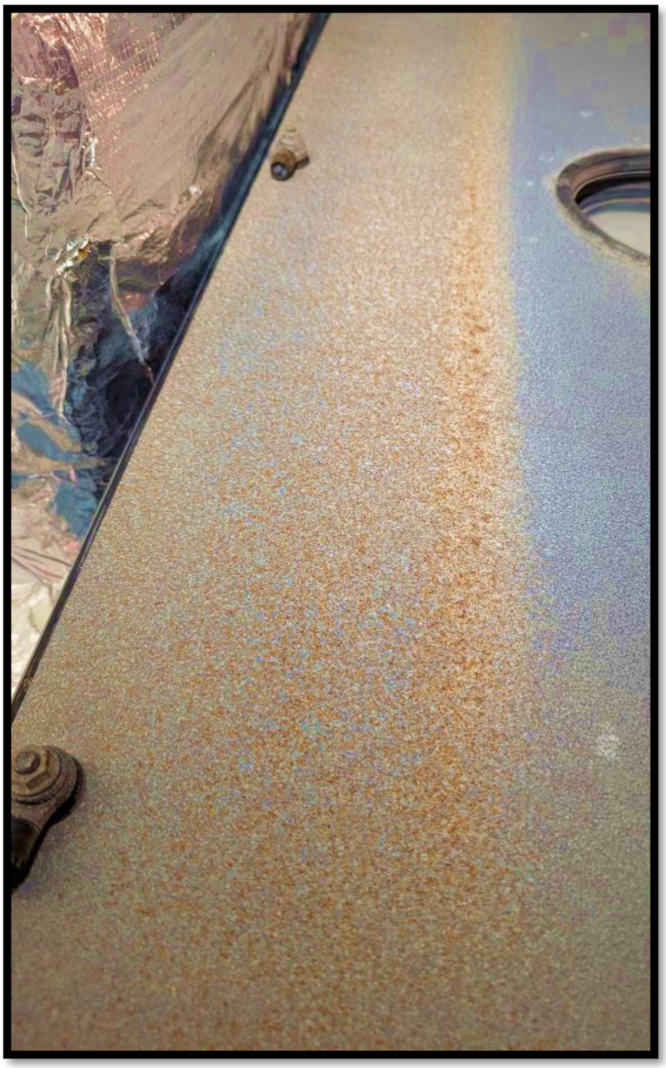
HALO HVAC

Photos

AHU06 – Pool Hall

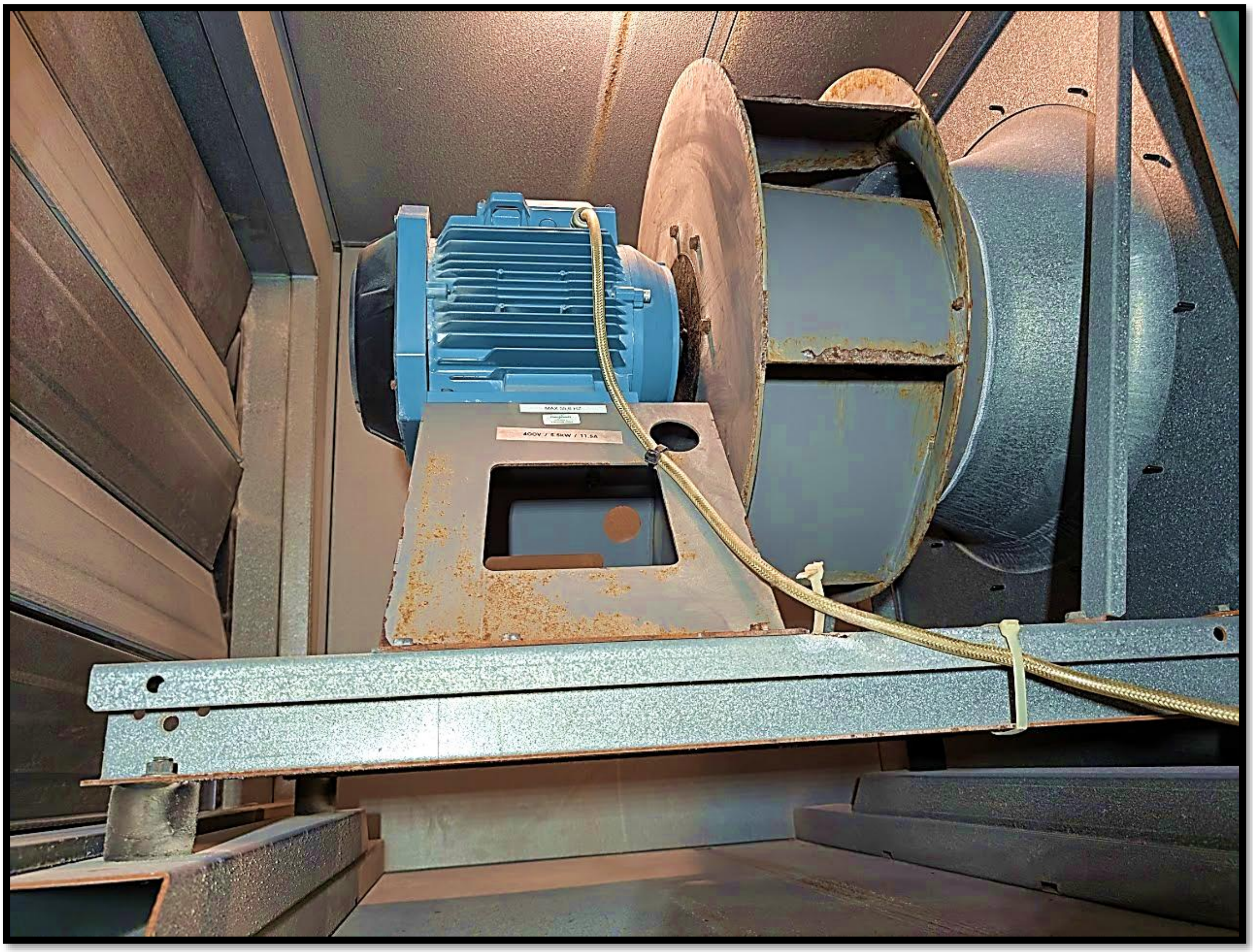
Corrosion Throughout

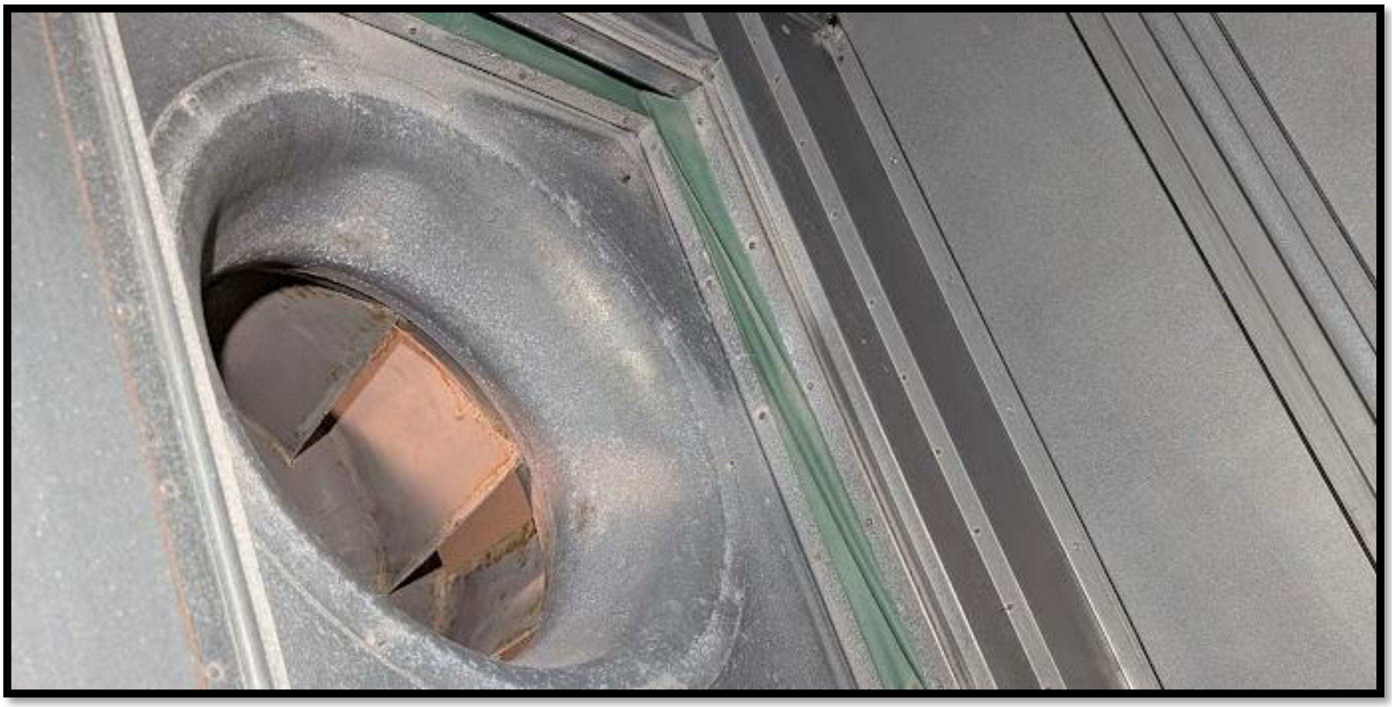




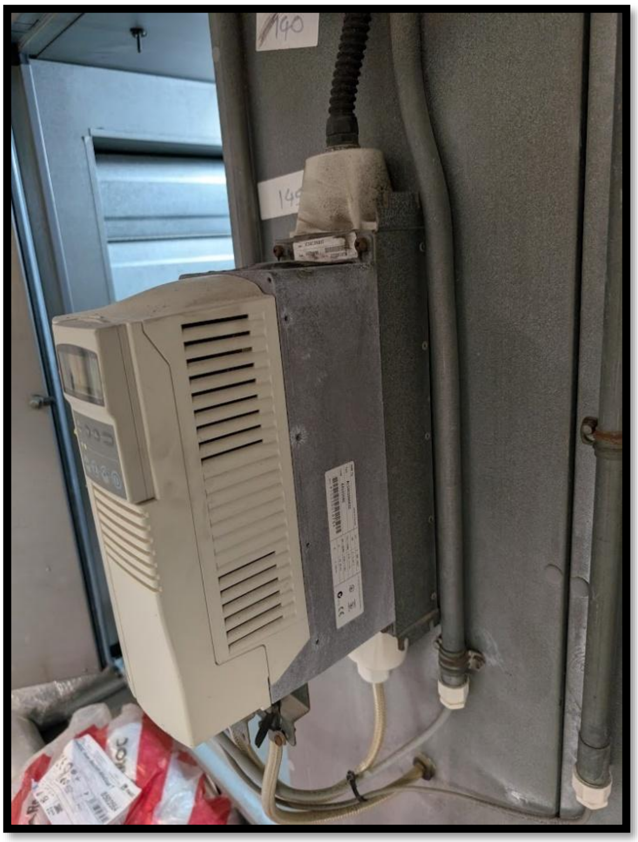
HALO HVAC

Corrosion Throughout Both Fan Sections and Directly Within Fan Impeller

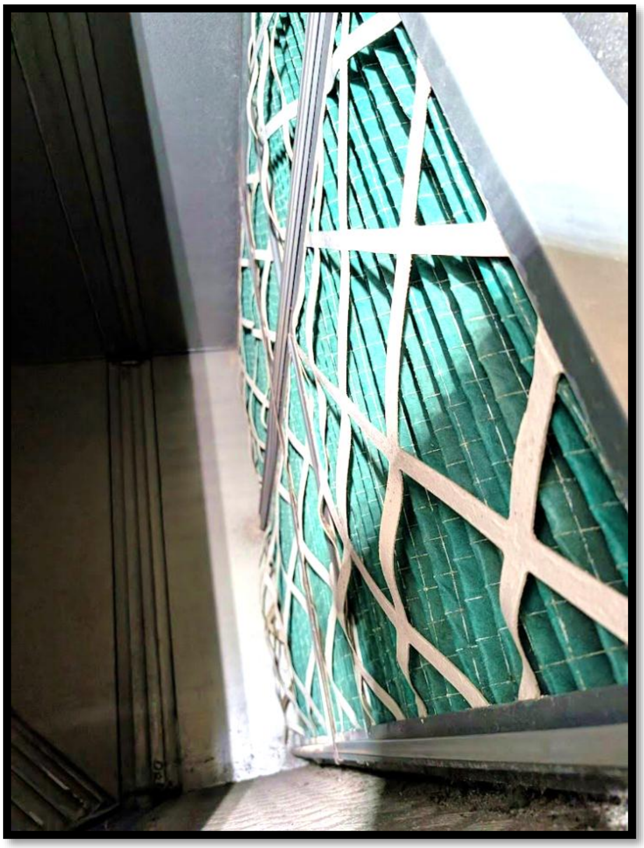




Invertor



Panel Filters



Heating Coil

Conclusion

AHU06 – Pool Hall

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Although the AHU remains structurally serviceable, multiple components—including the heating coil, fans, and plate heat exchanger—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU06 is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU06 – Pool Hall

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.
- Apply corrosion-resistant coatings where rust is present.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Possible damper and actuator replacement required.
- Install access panels for ongoing maintenance and inspection.

Heating Coil

- Replace coil and coil runners.
- Upgrade to reduce energy use and maintain heating reliability.

Panel Filter Wall

- Treat rust on filter frames or replace affected sections.
- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Bag Filters

- Upgrade existing F7 (EU7) bag filters to ISO ePM1 60% advanced synthetic filters with:
  - Lower pressure drop
  - Extended service life
  - Eurovent A+ energy efficiency rating

Plate Heat Exchanger

- Replace with a modern unit achieving ≥75% efficiency to comply with EU Ecodesign Regulation.
- Include integral damper replacement.

Supply Fan & Motor

- Replace the plug fan with an EC fan array in corrosion protective coating:
  - Improves efficiency
  - Eliminates belt losses
  - Enables precise airflow control

Exhaust Fan & Motor

- Retrofit the exhaust fan with an EC fan system for the same benefits listed above.

General AHU

Treat minor rust-affected areas with appropriate rust inhibitors and protective coatings, and replace severely corroded sections with new internal flooring and wall panels where necessary.

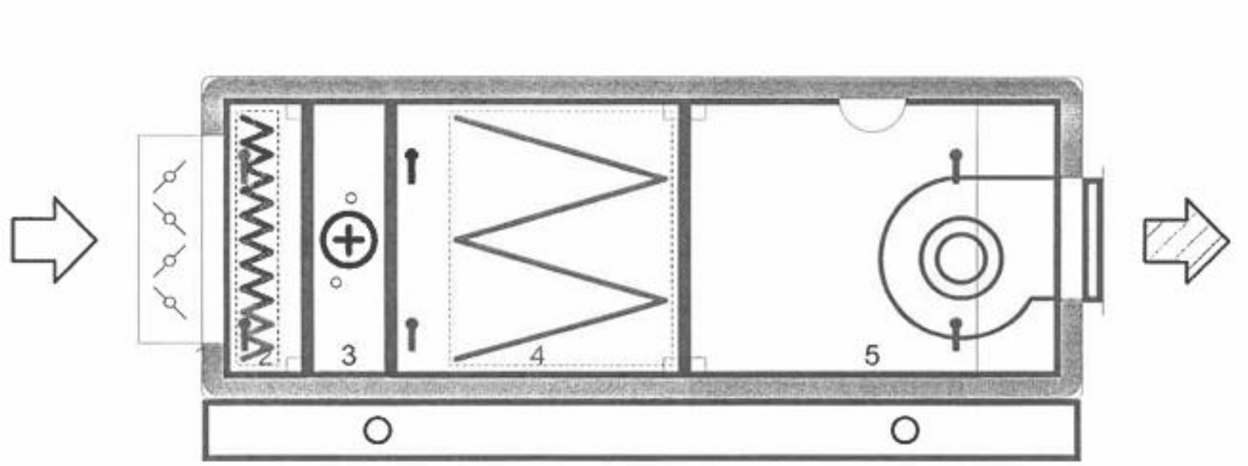
Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

HALO HVAC

Condition

AHU08 – Research Block

AHU drawing



Unit Overview:

This AHU, manufactured by Fläkt approximately 22 years ago, is located internally within a plantroom and was originally specified to deliver 0.4 m^3/s at 300 Pa for supply air. It is a supply-only unit with no provision for extract.

The AHU comprises a fresh air intake damper, heating coil, panel and bag filtration, and a belt-driven fan with motor. Externally, the unit appears to be in good condition, with no visible evidence of major repairs or retrofit modifications.

Intake Section:

immediately downstream of the intake duct is an empty section that lacks maintenance access. As the primary entry point for incoming supply air—subject to salt-laden conditions from the nearby Cork Harbour—this area is particularly susceptible to debris accumulation and corrosion.

We recommend conducting a detailed intrusive inspection of this section, followed by the installation of suitable access and inspection panels to support safe, effective, and routine maintenance.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The Dampers appeared to function correctly during local isolation and when switching on the fans.

Panel Filter Wall:

This section contains:

- 1x 1/1 G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 56Pa, with a recommended final pressure drop of 91Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Heating Coil:

Next up we have the heating coil, with very brittle fins. The existing heating coil, rated at 11.6 kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 8.7 kW of effective heating.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. Both the filters and their frames appear to be in generally ok condition, requiring minor rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Given that the AHU operates at 0.4 m^3/s with 300 Pa available pressure, there are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven fan and 0.55 kW motor, installed in 2003, have now been in operation for over 22 years—surpassing the typical service life expectancy for such components. At this stage, reduced performance efficiency and increased maintenance demands are to be expected due to mechanical wear in belts, bearings, and associated hardware.

To address these issues and enhance system performance, we recommend retrofitting the fan system with an EC (electronically commutated) fan. EC technology eliminates belt-driven losses, incorporates integrated variable-speed control, and provides significantly improved energy efficiency and airflow precision.

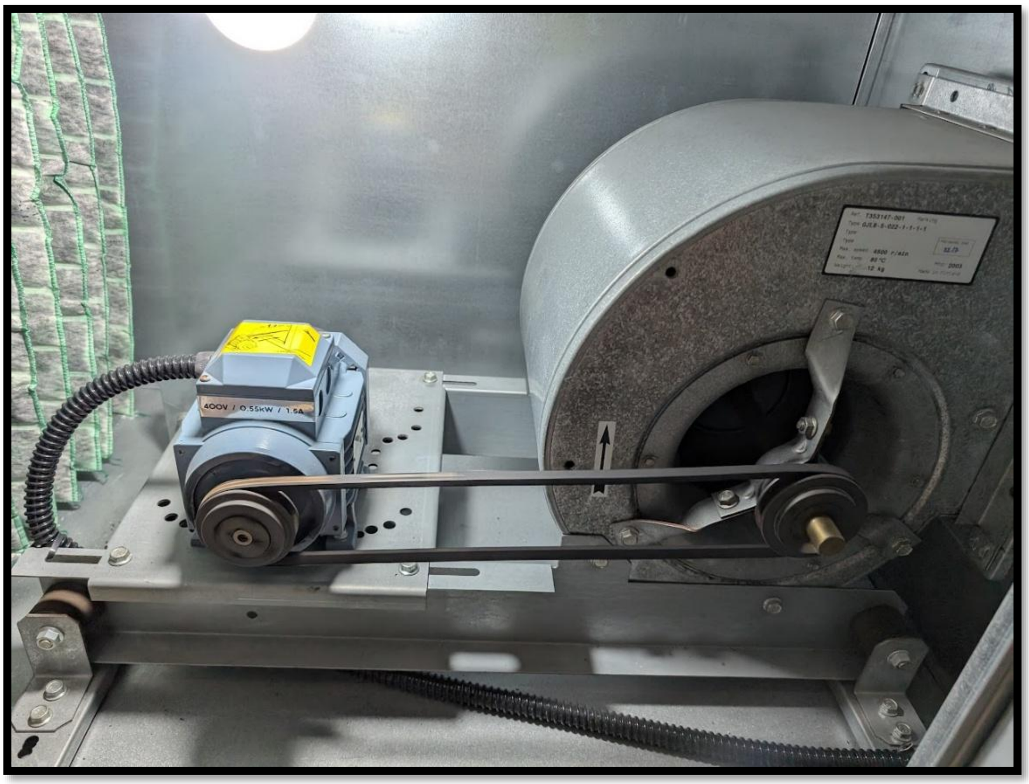
- Key Benefits of the Upgrade Include:
- Restoration of full airflow and pressure performance
- Improved reliability and reduced mechanical failure risk
- Elimination of belt maintenance tasks and associated labour costs
- Lower power consumption and ongoing energy savings

Although the existing motor's 0.55 kW rating suggests limited short-term energy savings, the long-term operational and cost benefits are substantial. This retrofit represents a low-risk, high-value investment that improves system efficiency, reduces lifecycle costs, and supports compliance with energy performance and sustainability targets.

HALO HVAC

Photos

AHU08 – Research Block



Conclusion

AHU08 – Research Block

- 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.

The condition assessment of AHU03 has been carried out in line with recognised industry standards, incorporating methodologies endorsed by CIBSE, RICS, and BESA. Originally manufactured by Fläkt and now in operation for over 22 years, the unit has surpassed the indicative economic life expectancy as defined in CIBSE Guide M (Appendix 12.A1). The survey methodology aligns with best practice recommendations for engineering inspections (CIBSE Guide M, Section 13) and asset classification criteria detailed in RICS NRM 3 and BESA SFG20.

While the AHU remains in generally good structural condition, several key components—including the heating coils and belt-driven fans—show signs of age-related wear and declining performance. This degradation is typical of equipment operating beyond its intended service life and presents growing risks in terms of efficiency, reliability, and compliance.

From the perspective of the Public Spending Code (PSC) and the Office of Public Works (OPW) Governance Framework, the continued use of ageing, inefficient components is no longer economically sustainable. A life cycle cost analysis supports a targeted refurbishment strategy over full system replacement. Recommended upgrades include the installation of EC (electronically commutated) fans, replacement of thermal coils, and improvements to filter systems.

Conclusion: Although in relatively good condition, AHU03 is a strong candidate for targeted refurbishment rather than decommissioning. By modernising ageing components and integrating high-efficiency replacements, the unit can be restored to optimal performance—potentially exceeding its original specification. This approach will enhance energy efficiency, ensure ongoing regulatory compliance, and extend the useful life of the asset, delivering long-term value in a cost-effective and standards-compliant manner.

Recommendations

AHU08 – Research Block

By upgrading ageing components—most of which have exceeded their intended service life of over 22 years—and addressing localised deficiencies through targeted interventions rather than full system replacement, overall efficiency can be restored, reliability enhanced, and regulatory compliance maintained, all while maximising the return on existing infrastructure investment.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Install access panels for ongoing maintenance and inspection.

Panel Filter Wall

- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Bag Filters

- Upgrade existing F7 (EU7) bag filters to ISO ePM1 60% advanced synthetic filters with:
  - Lower pressure drop
  - Extended service life
  - Eurovent A+ energy efficiency rating

Heating Coil

- Replace coil.
- Upgrade to reduce energy use and maintain heating reliability.

Supply Fan & Motor

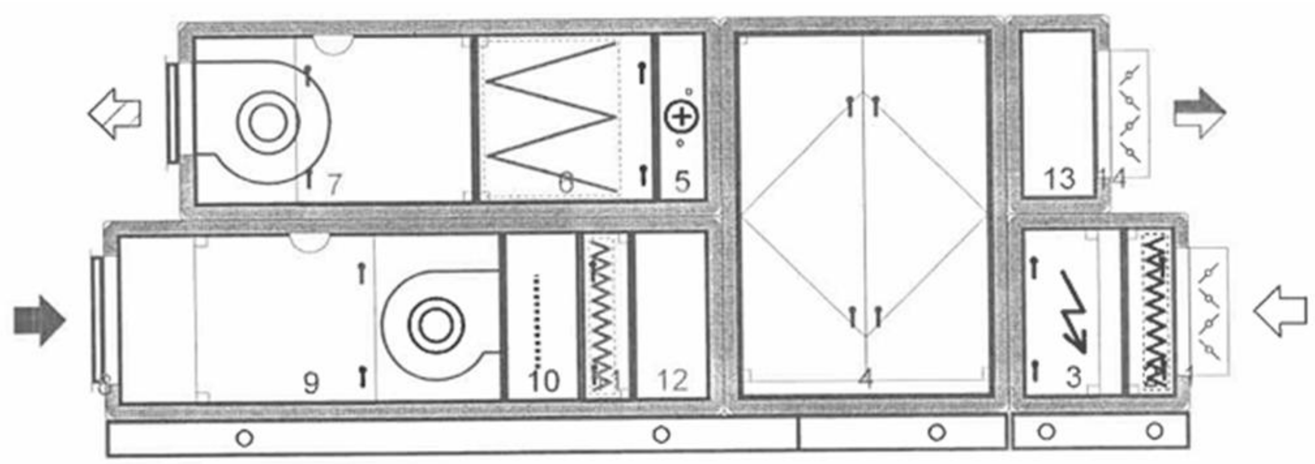
- Replace the belt-driven fan/motor with an EC fan:
  - Improves efficiency
  - Eliminates belt losses
  - Enables precise airflow control

Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

Condition

AHU11 – Block A Toilets

AHU drawing



Unit Overview:

This AHU, manufactured by Flakt approximately 22 years ago, is located internally within an upper level internal plantroom and was originally designed to achieve 1.1m³/s @ 300Pa for Supply Air and 1.1m³/s @ 300Pa for Exhaust Air. This unit appeared to be running fine.

The AHU consists of a fresh air inlet damper, electric frost coil, panel and bag filters, two belt driven fan and motors, Heating coils and Heat Exchanger. Externally the unit appears to be in good condition. There has been a new damper actuator installed within the exhaust section of the AHU – reasons unknown.

Intake Section:

Immediately downstream of the intake duct is an empty section with no provision for maintenance access. As this is the first contact point for incoming supply air—exposed to salt-laden air from nearby Cork Harbour—there is a significant risk of debris accumulation and corrosion. We recommend a detailed intrusive inspection of this area, followed by retrofitting appropriate access and inspection panels to facilitate ongoing maintenance.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The Dampers appeared to function correctly during local isolation and when switching on the fans.

Electric Heater Battery (EHB):

Going from intake to discharge, next is the electric heater battery (EHB). It is designed to raise incoming air from -3 °C to 6.1 °C, providing frost protection for all downstream components. It delivers a total heating capacity of 12.1 kW. While this may appear modest, it is appropriately sized given the average winter temperatures at Cork Harbour, which range from 8 °C to 10 °C during the day and 2 °C to 5 °C at night (December to February). Frost occurrence is infrequent due to the coastal influence of the nearby Atlantic Ocean.

Concerningly the EHB is currently installed with only 150 mm clearance from cardboard panel filters.

While there is no specific Irish regulation mandating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidance generally recommend a minimum clearance of 300 mm.

This spacing is essential to:

- Prevent filter overheating
- Reduce fire risk, especially with synthetic or combustible media
- Ensure uniform airflow and prevent hot spots that could damage components

Additional Best Practices:

- Where reduced spacing is unavoidable, use non-combustible or metal-framed filters
- Include airflow interlocks and high-temperature cut-outs for safety

We recommend replacing the existing EHB and repositioning the panel work to provide a clearance exceeding 300 mm, ensuring full compliance with international fire safety and operational efficiency standards. Furthermore, we advise upgrading to a modern, energy-efficient EHB capable of delivering the same heating output with lower power consumption, thereby improving system performance and reducing operational costs.

Panel Filter Wall:

This section contains:

- 1x 1/1 G3 filters
- 1x ½ G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 53 Pa, with a recommended final pressure drop of 123 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 10 °C, and an exhaust air range of 21 °C down to 10.1 °C. It provides 17.2 kW of heat recovery, equating to a thermal efficiency of 54%.

While the unit appears to be in good physical condition, the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m³/h—this unit operates at approximately Supply Air: 3960 m³/h @ 300 Pa, Exhaust Air: 3960 m³/h @ 300 Ph, well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Heating Coil:

Next up we have the heating coil, with very brittle fins. The existing heating coil, rated at 17.3kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 12.1 – 13.8 kW of effective heating.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. Both the filters and their frames appear to be in generally ok condition, requiring minor rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Given that the AHU operates at 1.1m³/s with 300 Pa available pressure, there are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven fan and 2.2 kW motor, manufactured in 2003, are now over 22 years old—well beyond the typical service life expectancy for such components.

As a result, the system is operating inefficiently, with a significant portion of the electrical input lost due to mechanical wear and reduced airflow output. Degradation in components such as belts, pulleys, bearings, and impellers over time leads to slippage, vibration, and loss of fan speed—all contributing to reduced system performance.

Given this level of underperformance and the age of the equipment, we recommend retrofitting the system with EC (electronically commutated) fans as soon as possible. EC fans offer superior energy efficiency, variable-speed control, and eliminate belt losses entirely, providing more precise airflow management and significantly lower power consumption.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Panel Filter Wall:

Going back through exhaust section, and after the heat exchanger that was covered earlier in this document, we have another panel filter wall. This section contains:

2x 1/1 G3 filters
3x ½ G3 filters

The filters are rated for an initial pressure drop of 59 Pa, with a recommended final pressure drop of 129 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition. The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance

Exhaust Fan Section

Almost identical to the supply fan, this fan instead has a motor of 2.2kW motor, manufactured in 2003 is also over 22 years old—well beyond the typical service life expectancy for such components.

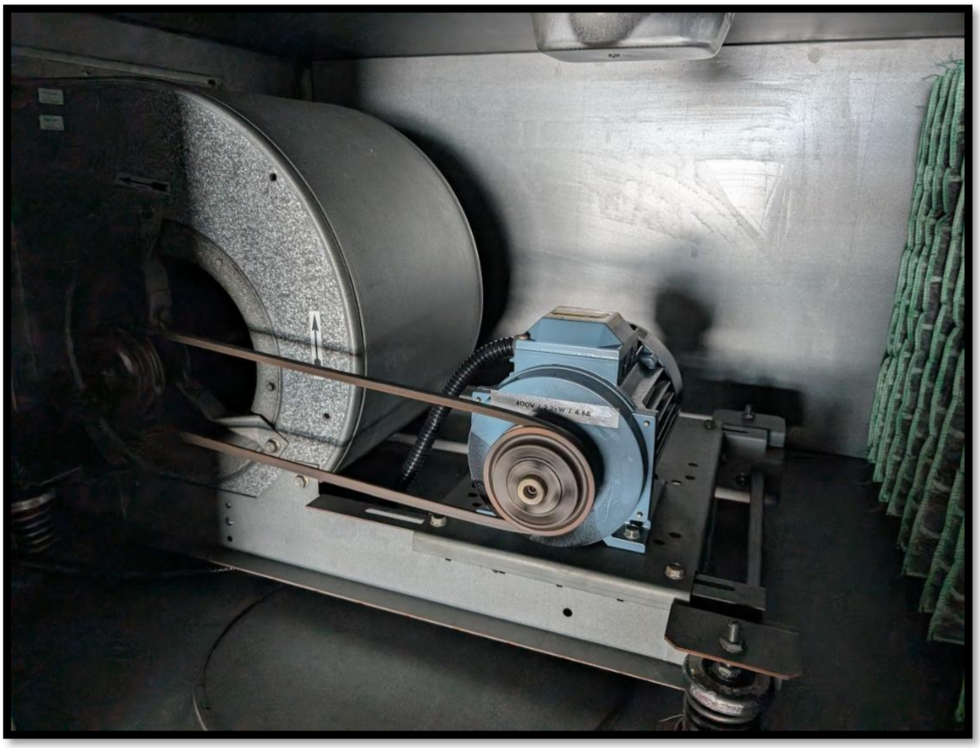
As a result, the system is operating inefficiently, with a significant portion of the electrical input lost due to mechanical wear and reduced airflow output. Degradation in components such as belts, pulleys, bearings, and impellers over time leads to slippage, vibration, and loss of fan speed—all contributing to reduced system performance.

Given this level of underperformance and the age of the equipment, we recommend retrofitting the system with EC (electronically commutated) fans as soon as possible. EC fans offer superior energy efficiency, variable-speed control, and eliminate belt losses entirely, providing more precise airflow management and significantly lower power consumption.

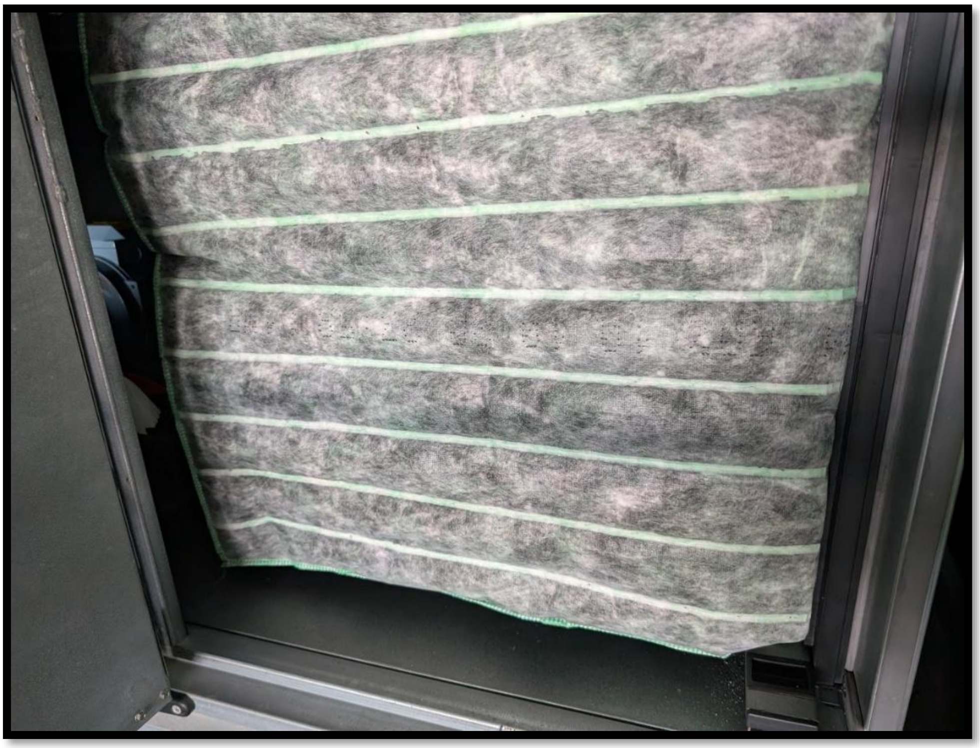
This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Photos

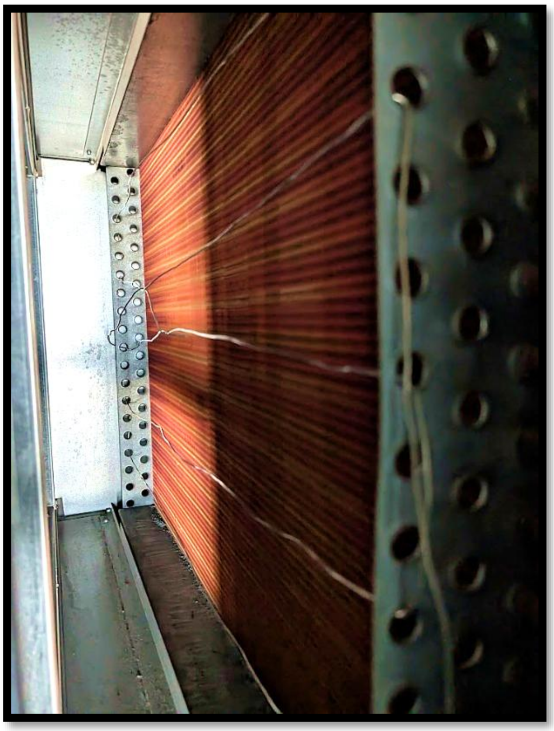
AHU11 – Block A Toilets



Supply Fan Section

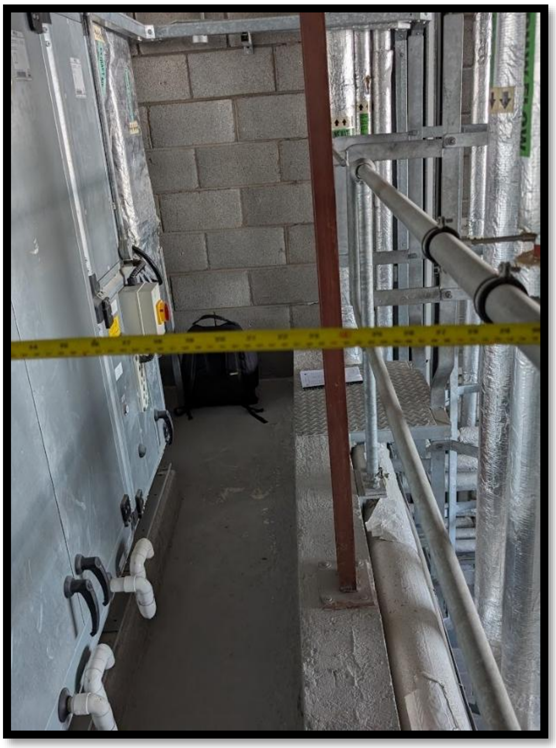


Supply Bag Filters



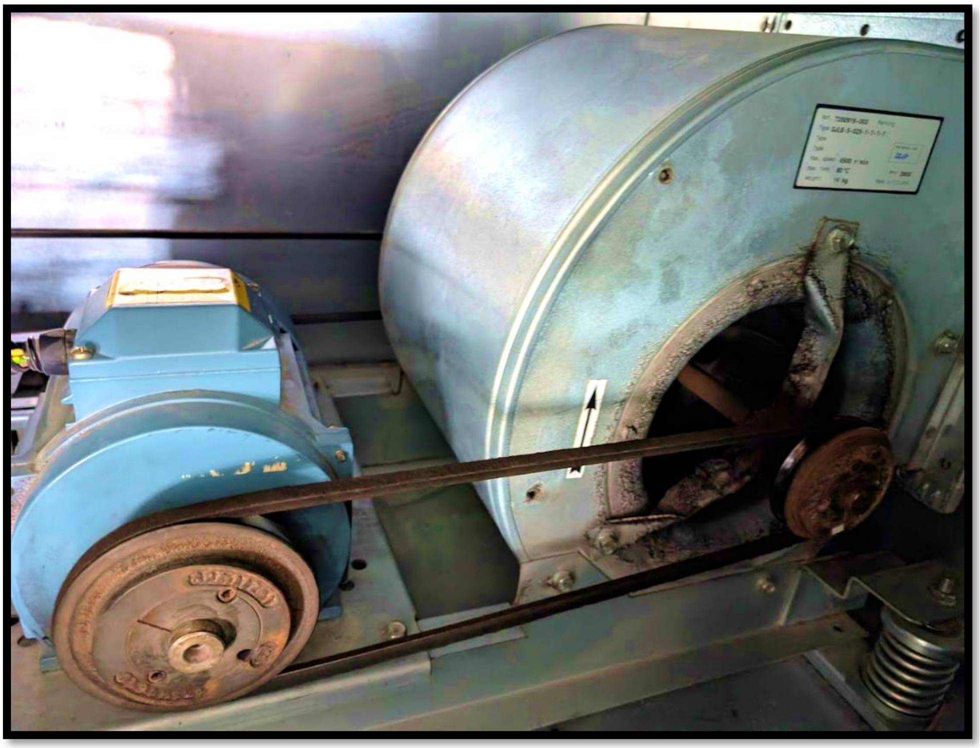
Heating Coil Corrosion

Unlagged Pipework – Heat Loss

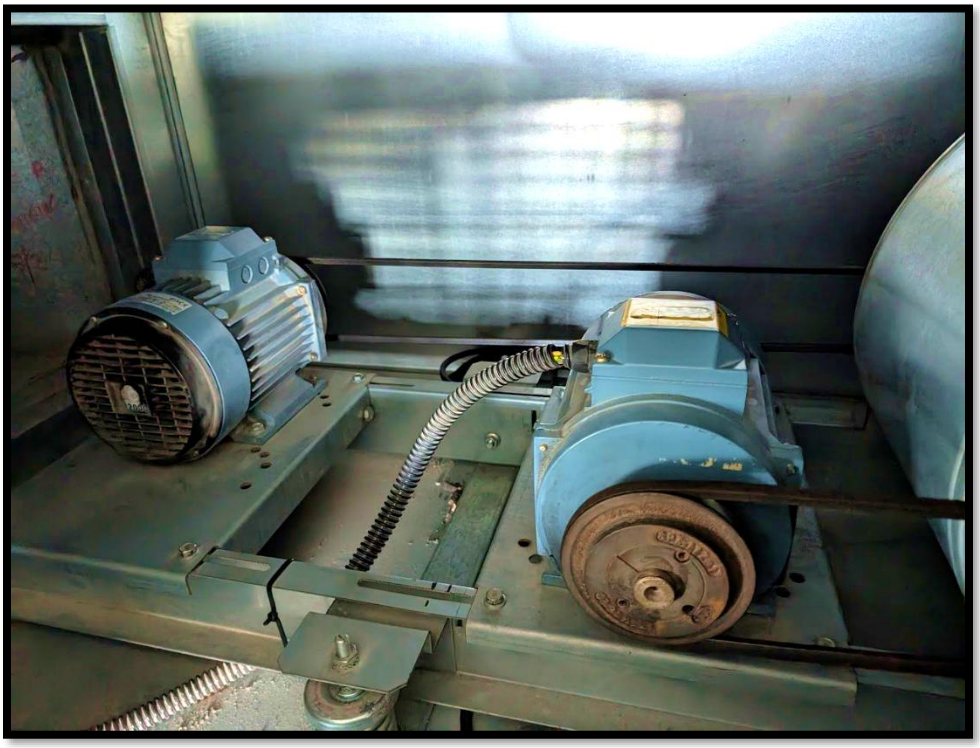


Coil Access Limitations

Air Off Damper Side – unable to access air on, signs of debris/corrosion through dampers



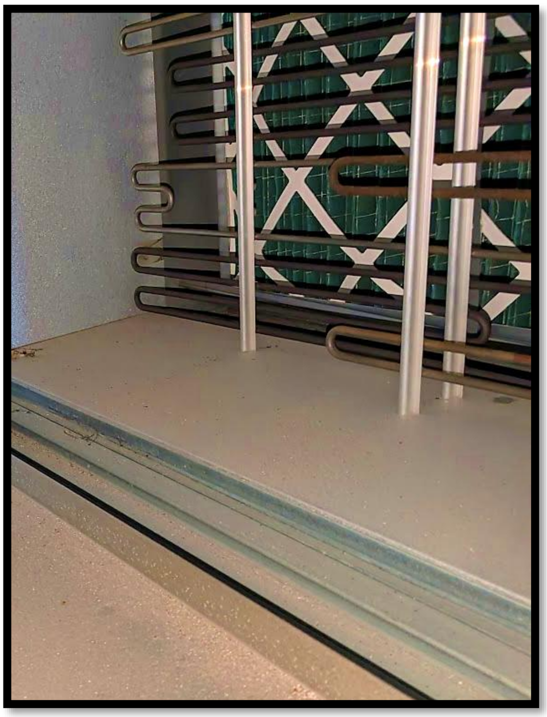
Exhaust Fan Section



Exhaust Fan Motor Corrosion

Intake Filter Section debris/Corrosion

Debris Build Up Air Off Side Heat Exchanger



Electric Heater Battery Corroded

Supply Damper Actuator

Heat Exchanger

Conclusion

AHU11 – Block A Toilets

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Although the AHU remains structurally serviceable, multiple components—including the cooling and heating coils, belt-driven fans, electric heater battery, and plate heat exchanger—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

Concluding, AHU11 is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU11 – Block A Toilets

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.
- Apply corrosion-resistant coatings where rust is present.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Possible damper and actuator replacement required.
- Install access panels for ongoing maintenance and inspection.

Electric Heater Battery

- Replace the EHB with a modern, energy-efficient equivalent.
- Reconfigure panel layout to provide ≥300 mm clearance from filters, as per best practice.
- Install non-combustible filters or thermal protection if clearance cannot be achieved.

Panel Filter Wall

- Treat rust on filter frames or replace affected sections.
- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Bag Filters

- Upgrade existing F7 (EU7) bag filters to ISO ePM1 60% advanced synthetic filters with:
  - Lower pressure drop
  - Extended service life
  - Eurovent A+ energy efficiency rating

Plate Heat Exchanger

- Replace with a modern unit achieving ≥75% efficiency to comply with EU Ecodesign Regulation.
- Include integral damper replacement.

Heating Coil

- Replace coil showing fin brittleness and capacity loss.
- Upgrade to reduce energy use and maintain heating reliability.

Supply Fan & Motor

- Replace the belt-driven fan/motor with an EC fan:
    - Improves efficiency
    - Eliminates belt losses
    - Enables precise airflow control
    - ROI estimated at ~2.2 years

Exhaust Fan & Motor

- Retrofit the exhaust fan with an EC fan system for the same benefits listed above.

Exhaust Panel Filters

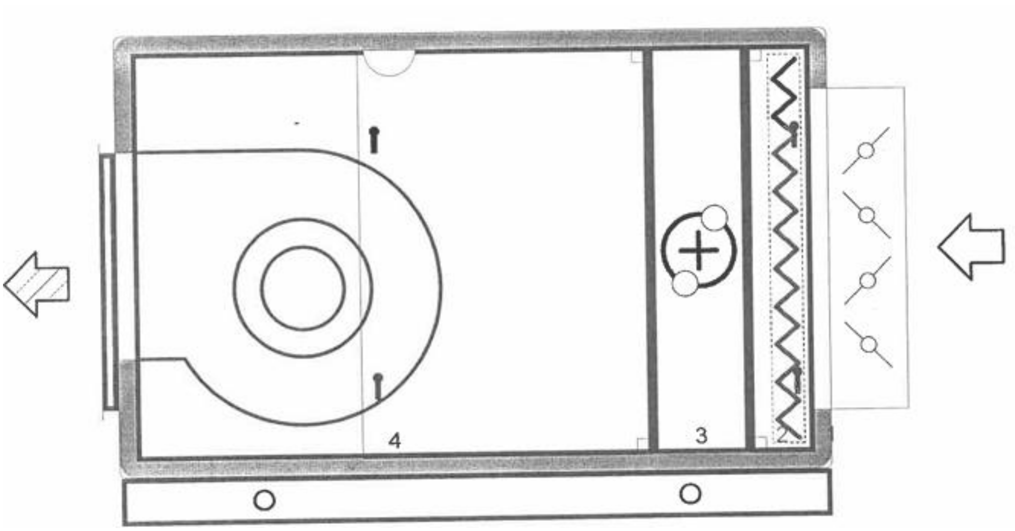
- Treat or replace corroded frames.
- Consider upgrading to low-resistance G4 or ePM10 filters for energy savings.

Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

Condition

AHU12 – Welding Workshop

AHU drawing



Unit Overview:

This Air Handling Unit (AHU), manufactured by Fläkt approximately 22 years ago, is a supply-air-only unit located within an upper-level internal plantroom. It was originally specified to deliver a supply airflow rate of 4.67 m^3/s at 300 Pa external static pressure. At the time of the survey, the unit was not operational, and functional testing could not be carried out.

The AHU comprises a fresh air intake damper, panel filtration system, belt-driven supply fan with associated motors, and a heating coil. The configuration is typical of legacy systems designed for basic ventilation and space heating functions. Although the unit is no longer operating at peak design standards due to its age, the external casing and access panels appear to be in generally good physical condition, with no visible signs of structural damage.

Intake Section:

Immediately downstream of the intake duct is an unoccupied section that currently lacks any provision for maintenance access. As the first point of contact for incoming supply air—exposed to salt-laden atmospheric conditions due to the site's proximity to Cork Harbour—this area is particularly vulnerable to debris accumulation and corrosion.

It is recommended that a detailed intrusive inspection be carried out to assess the internal condition of this section. Following inspection, suitable access and inspection panels should be installed to facilitate safe, ongoing maintenance and enable regular monitoring of potential corrosion or contamination over time.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The Dampers appeared to function correctly during local isolation and when switching on the fans.

Panel Filter Wall:

This section contains:

- 4x 1/1 G4 filters
- x ½ G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 58 Pa, with a recommended final pressure drop of 128 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Heating Coil:

The next component in the system is the heating coil, it shows clear signs of age-related deterioration—most notably brittle fin surfaces. This heating coil, originally rated at 118.7 kW, has been in continuous operation for 22 years and has likely experienced a significant decline in output capacity.

Heating coils commonly degrade by 20% to 40% over time due to factors such as scale accumulation, internal corrosion (particularly in water-based systems), fouling of the fin surfaces, and reduced airflow. In coastal environments like Cork Harbour, exposure to salt-laden air can further accelerate this degradation process. As a result, the effective heating output of this coil is now estimated to be in the range of 71–83 kW.

Given that the typical service life of a heating coil is 15 to 20 years, this component has exceeded its expected operational lifespan. We recommend full replacement of the coil to restore design heating capacity, improve thermal efficiency, and reduce the risk of system failure during peak heating demand. This proactive measure will also support long-term reliability and energy performance goals.

Supply Fan Section

The existing belt-driven fan and 5.5 kW motor, installed in 2003, have now exceeded 22 years of operation—well beyond the expected service life for components of this type. Over time, mechanical degradation of belts, pulleys, bearings, and impellers typically leads to reduced efficiency, increased vibration, and growing maintenance demands. The current configuration also results in energy losses inherent to belt-driven systems.

Due to the age of the equipment and its declining performance, we strongly recommend retrofitting this unit with EC (electronically commutated) fan technology. EC fans provide integrated variable-speed control, eliminate belt losses, and offer significantly improved energy efficiency and airflow accuracy.

Notably, the physical layout and airflow characteristics of this specific AHU make it particularly well-suited for an EC fan retrofit. The fan section allows for optimal integration of EC fans, enabling enhanced control and operation at variable speeds depending on system demand. This adaptability can yield substantial energy savings, especially when compared to fixed-speed or inefficient inverter-driven belt systems operating at partial load conditions.

Key Benefits of the Upgrade Include:

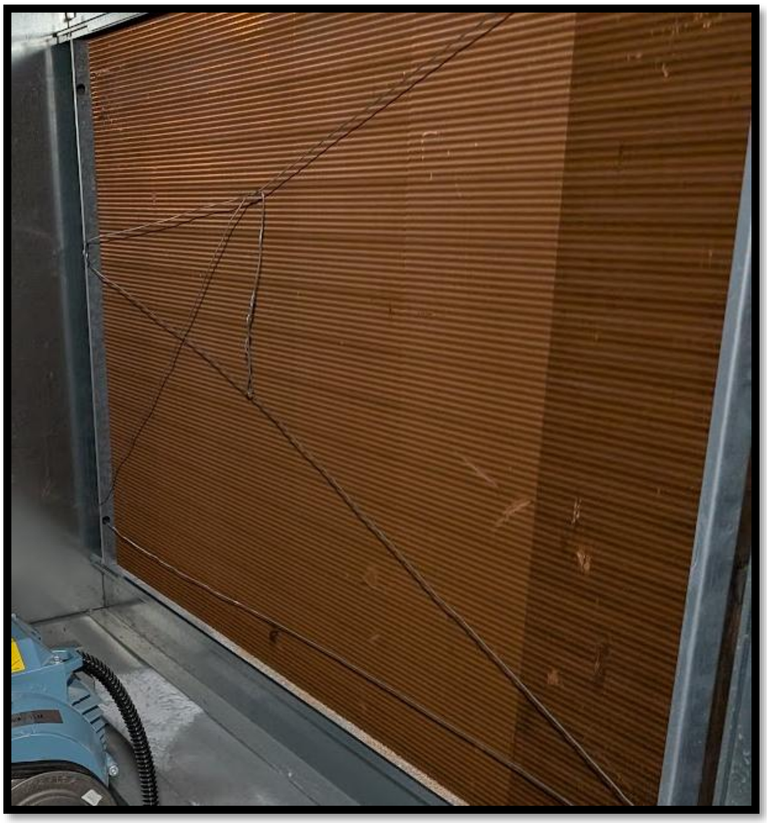
- Restoration of full airflow and pressure performance
- Improved system reliability and operational stability
- Elimination of belt maintenance, associated labour, and parts costs
- Significant reduction in energy consumption due to demand-based modulation
- Long-term cost savings and alignment with energy efficiency and sustainability targets

This targeted upgrade represents a high-impact, cost-effective investment with strong return potential, both in terms of performance recovery and ongoing energy savings.

Photos

AHU12 – Welding Workshop

Supply Fan Section



Heating Coil

Inaccessible Damper/Intake Section

Conclusion

AHU12 – Welding Workshop

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Although the AHU remains structurally serviceable, multiple components—including the heating coils, belt-driven fans—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU11 is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU12 – Welding Workshop

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake section

- Conduct a detailed intrusive inspection of the intake void.
- Retrofit access panels to enable safe maintenance.
- Apply corrosion-resistant coatings where rust is present.

Intake Dampers

- Investigate damper modulation capability via BMS.
- Possible damper and actuator replacement required.
- Install access panels for ongoing maintenance and inspection.

Panel Filter Wall

- Treat rust on filter frames or replace affected sections.
- Replace with high-efficiency, low-resistance panel filters to reduce fan load and improve air quality.

Heating Coil

- Replace coil showing fin brittleness and capacity loss.
- Upgrade to reduce energy use and maintain heating reliability.

Supply Fan & Motor

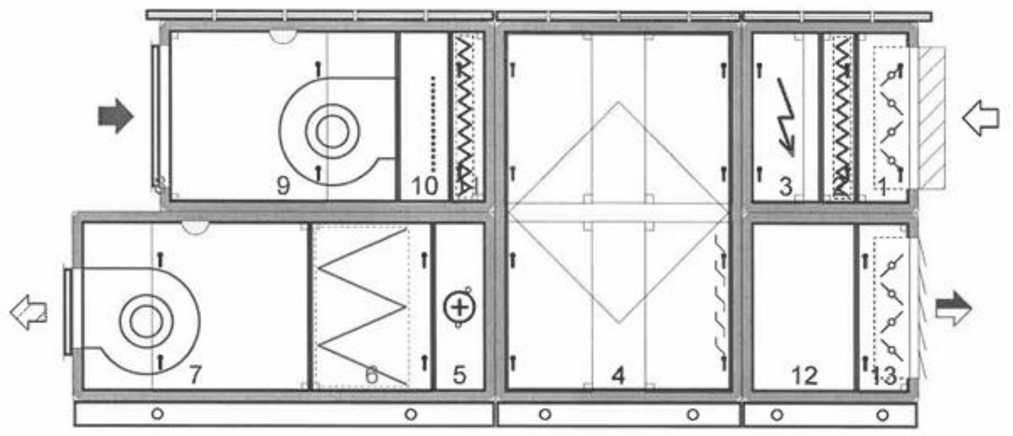
- Replace the belt-driven fan/motor with an EC fan:
    - Improves efficiency
    - Eliminates belt losses
    - Enables precise airflow control
    - ROI estimated at ~2.2 years

Refurbishing this AHU presents a cost-effective opportunity to extend its operational life and enhance performance without the expense of full replacement.

Condition

AHU04 – Restaurant

AHU drawing



Unit Overview:

This Air Handling Unit (AHU), manufactured by Fläkt approximately 22 years ago, is installed externally on the rooftop and was originally designed to deliver 2.40 m³/s at 300 Pa for both supply and exhaust air. It forms part of a balanced ventilation system typical of commercial or institutional applications.

The AHU includes a fresh air intake damper, electric frost coil, panel and bag filtration, two belt-driven fans with associated motors, a heating coil, and a heat exchanger.

During the inspection, the unit was found to be in poor external condition. Significant age-related deterioration was evident, particularly across the electrical containment systems, which show clear signs of degradation. Multiple access panels, along with the unit's roof structure, exhibit widespread corrosion. These issues raise concerns regarding potential water ingress, compromised insulation, and the overall structural integrity of the AHU casing.

At the intake section, the unit is fitted with an eliminator rather than a weather louvre. Typically, eliminators are positioned downstream of cooling coils to capture condensate carryover—not at the intake where rain and airborne moisture must be deflected. The absence of a dedicated weather louvre likely contributes to excessive moisture ingress, which appears to have accelerated internal corrosion throughout the AHU.

This configuration is not aligned with best practice for weather protection in externally mounted AHUs, particularly in exposed or high-precipitation environments. Retrofitting a proper weather louvre and addressing existing corrosion should be considered a priority to prevent further internal deterioration and to extend the serviceable life of the unit.

Intake Section:

Immediately downstream of the intake duct is an empty section that currently lacks any provision for maintenance access. As this area is the initial point of contact for incoming supply air—exposed to salt-laden air from the nearby Cork Harbour—it is particularly vulnerable to debris accumulation and corrosion over time.

Compounding this issue, the unit is not fitted with a weather louvre at the intake. Instead, a droplet eliminator has been installed, which is typically used downstream of cooling coils to capture condensate carryover, not as a primary barrier against rain or airborne moisture. This configuration does not align with best practice for weather protection and likely contributes to moisture ingress, further accelerating internal corrosion within the unit.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The actuator assemblies themselves are showing visible signs of weathering and age-related deterioration, potentially impacting their long-term reliability and control accuracy.

Panel Filter Wall:

This section contains:

- 2x 1/1 G3 filters

Immediately downstream of the Electric Heater Battery (EHB) is a panel filter wall. The filters in place are rated for an initial pressure drop of 79Pa, with a recommended final pressure drop of 149Pa. While specific maintenance and replacement intervals have not been documented, all filters observed during the inspection appeared to be in generally good condition.

However, visible corrosion was noted on several filter frames. This deterioration is likely a result of prolonged exposure to salt-laden air from the nearby Cork Harbour, compounded by the absence of adequate weather protection in the upstream intake section. The corrosion presents a risk to both structural integrity and hygienic operation and will require either full frame replacement or appropriate corrosion treatment.

It is likely that these filters become waterlogged during certain times of the year, particularly during periods of high rainfall or humidity. This condition can lead to a range of operational issues within the AHU, including increased pressure drop, reduced airflow, microbial growth, and potential damage to downstream components.

Electric Heater Battery (EHB):

The galvanised steel enclosure of the EHB is corroded throughout. It is designed to raise incoming air from -3 °C to 8°C, providing frost protection for all downstream components. It delivers a total heating capacity of 32kW. While this may appear modest, it is appropriately sized given the average winter temperatures at Cork Harbour, which range from 8 °C to 10 °C during the day and 2 °C to 5 °C at night (December to February). Frost occurrence is infrequent due to the coastal influence of the nearby Atlantic Ocean.

Concerningly the EHB is currently installed with only 150 mm clearance from cardboard panel filters.

While there is no specific Irish regulation mandating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidance generally recommend a minimum clearance of 300 mm.

This spacing is essential to:

- Prevent filter overheating
- Reduce fire risk, especially with synthetic or combustible media
- Ensure uniform airflow and prevent hot spots that could damage components

Additional Best Practices:

- Where reduced spacing is unavoidable, use non-combustible or metal-framed filters
- Include airflow interlocks and high-temperature cut-outs for safety

We recommend replacing the existing EHB and repositioning the panel work to provide a clearance exceeding 300 mm, ensuring full compliance with international fire safety and operational efficiency standards. Furthermore, we advise upgrading to a modern, energy-efficient EHB capable of delivering the same heating output with lower power consumption, thereby improving system performance and reducing operational costs.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of 3 °C to 12.4°C, and an exhaust air range of 21 °C down to 11.7 °C. It provides 27.2kW of heat recovery, equating to a thermal efficiency of 52%.

The heat exchanger its self is laden with spores of microbial growth due to lack of maintenance and poor AHU design. Furthermore the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m^3/h—this unit operates well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Heating Coil:

Next up we have the heating coil, with very brittle fins and corrosion throughout. The existing heating coil, rated at 63.9kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 38.3kw of heating output. This is based at the higher end of a 40% degradation, given its current condition.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. The frames exhibit significant signs of rusting, requiring rust treatment, replacement and debris cleaning. We also recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

There are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven supply fan and 5.5 kW motor, manufactured in 2003, have been in continuous operation for over 22 years—exceeding the typical service life expectancy for such components. During the inspection, the fan housing, pulleys, and associated support structures showed significant signs of corrosion, particularly around fastenings and structural interfaces. This level of deterioration raises concerns regarding long-term mechanical reliability, alignment stability, and the potential for further degradation under load.

Corrosion of this nature can also lead to increased vibration, belt wear, and energy inefficiencies. Given the age and observed condition, replacement of the fan assembly with a modern, corrosion-resistant EC (electronically commutated) fan system is recommended to restore performance, improve efficiency, and reduce future maintenance risk.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Panel Filter Wall:

Going back through exhaust section, and after the heat exchanger that was covered earlier in this document, we have another panel filter wall. This section is heavily contaminated with corrosion and contains:

1x 1/1 G3 filters
2x ½ G3 filters

The filters are rated for an initial pressure drop of 74 Pa, with a recommended final pressure drop of 149 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition. The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance

Exhaust Fan Section

Almost identical to the supply fan, The existing belt-driven exhaust fan and 5.5 kW motor, manufactured in 2003, have been in continuous operation for over 22 years—exceeding the typical service life expectancy for such components. During the inspection, the fan housing, pulleys, and associated support structures showed significant signs of corrosion, particularly around fastenings and structural interfaces. This level of deterioration raises concerns regarding long-term mechanical reliability, alignment stability, and the potential for further degradation under load.

Corrosion of this nature can also lead to increased vibration, belt wear, and energy inefficiencies. Given the age and observed condition, replacement of the fan assembly with a modern, corrosion-resistant EC (electronically commutated) fan system is recommended to restore performance, improve efficiency, and reduce future maintenance risk.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Electrical containment

All electrical containment associated with this AHU requires full replacement due to extensive weather-related deterioration. Prolonged exposure to severe external conditions has resulted in widespread corrosion and physical damage across sensors, actuators, local isolators, cable trunking, and associated wiring.

Many components exhibit signs of water ingress, UV damage, and mechanical fatigue, posing serious risks to operational reliability and electrical safety. To ensure safe, compliant, and long-term functionality, we recommend a complete replacement of the electrical system—including all field devices, containment, and cabling—with weather-resistant, IP-rated components suitable for external environments.

Retrofit of Louvre and Cowel

The existing air intake arrangement for this rooftop AHU is not adequately designed to withstand prevailing weather conditions. The current setup lacks a proper weather louvre and protective cowl, relying instead on a non-compliant eliminator that does not provide sufficient defence against wind-driven rain, airborne debris, or salt-laden air—especially given the site's coastal exposure. As a result, the unit has been subject to repeated water ingress and corrosion, contributing to the deterioration of internal components and electrical systems.

In accordance with Irish Building Regulations Part F – Ventilation and best practice guidance such as CIBSE AM13 and DW/144 (HVAC Ductwork Specification), externally mounted AHUs must incorporate weatherproof intake designs, including louvres with adequate free area, drainage paths, and rain defence classification suitable for roof-level exposure. To meet these requirements and protect the longevity of the AHU, we strongly recommend the installation of a compliant weather louvre and external cowl. These additions will help prevent further water ingress, reduce internal corrosion, and ensure the unit meets modern standards for ventilation system resilience and weather protection.

Roof

The AHU roof structure exhibits clear signs of age-related deterioration, including visible corrosion, delamination of the external cladding, and damage to the underlying thermal insulation. Several areas show evidence of moisture ingress, likely due to long-term exposure to severe weather conditions and the breakdown of protective coatings and vapour barriers. This type of degradation compromises both the thermal performance and structural integrity of the unit, increasing the risk of water penetration, thermal bridging, and further corrosion over time.

In line with best practice outlined in CIBSE Guide M, DW/143 (Guide to Air Handling Units), and relevant sections of the Irish Building Regulations Part L – Conservation of Fuel and Energy, the thermal envelope of externally mounted AHUs must maintain adequate insulation continuity and weather resistance to prevent energy loss and material failure.

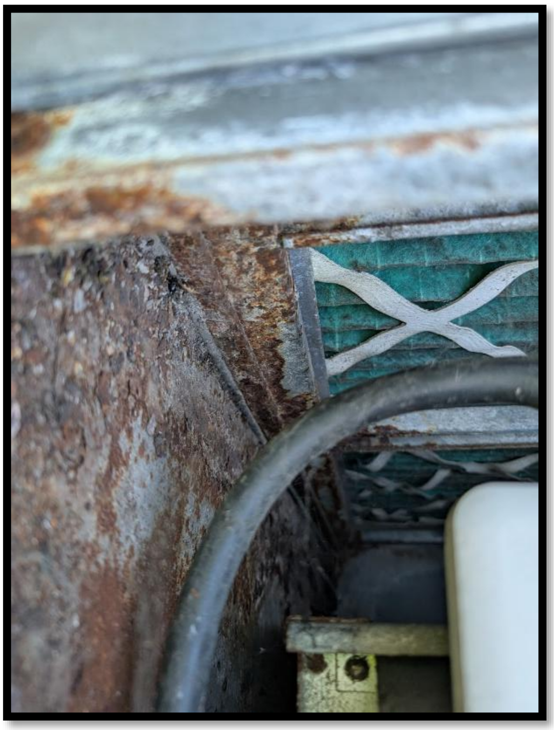
Photos

AHU04 – Restaurant

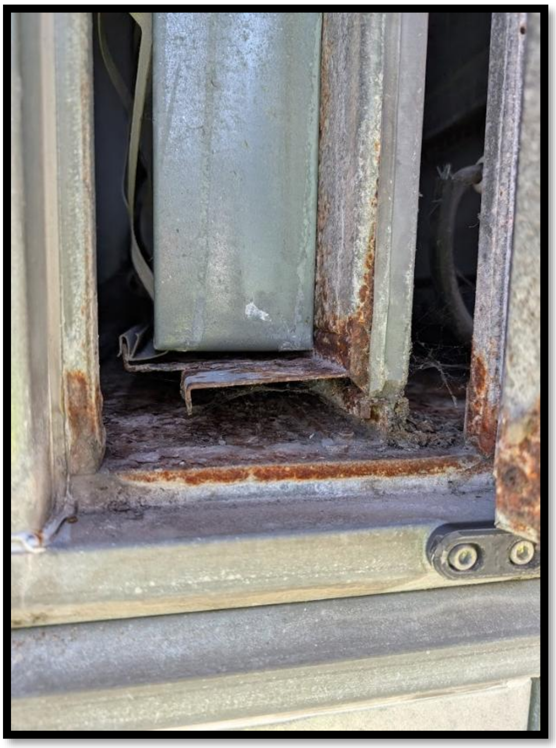
Supply Fan Section

Intake Debris/Corrosion

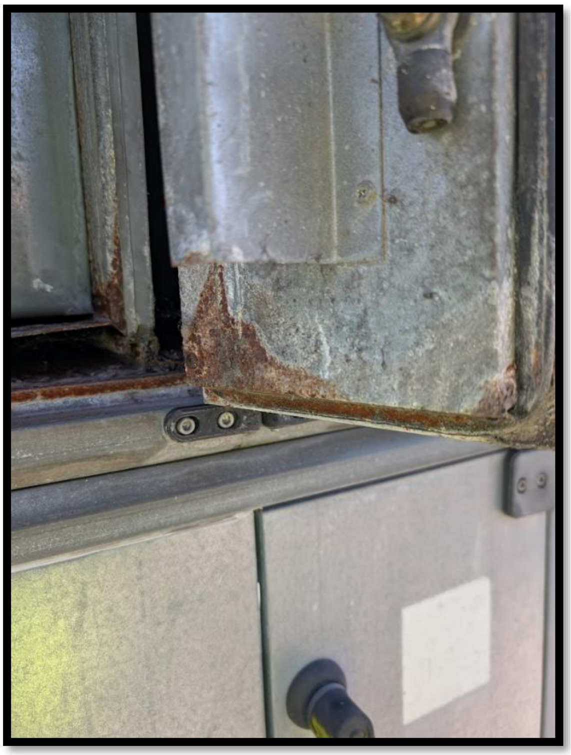
Heating Coil Corrosion



Intake Section Corrosion



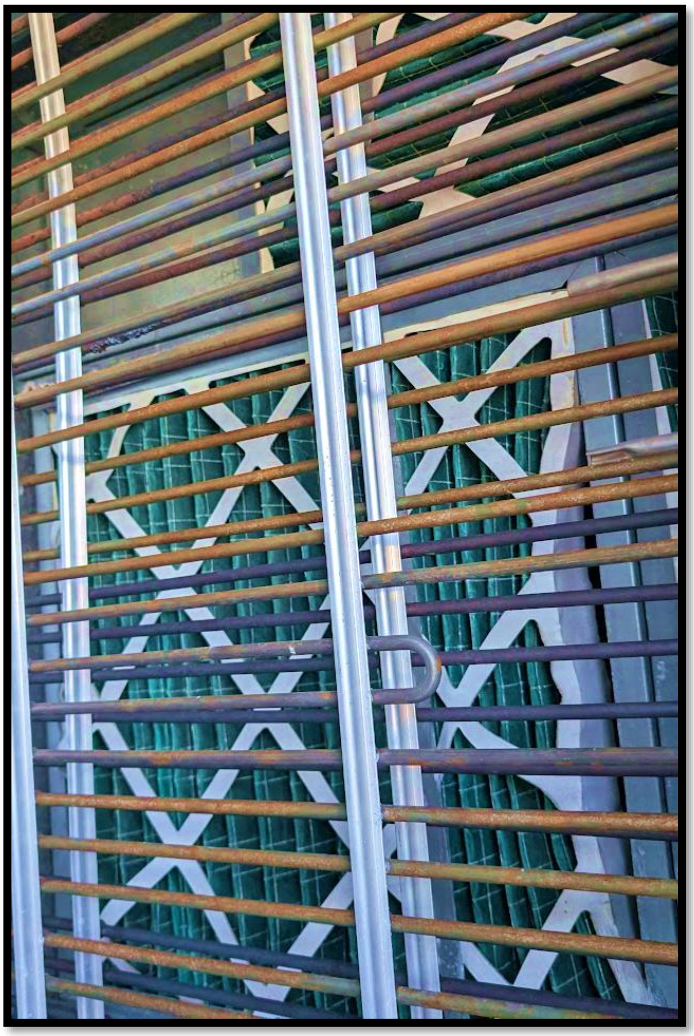
Corrosion



Rusting of Access Panels

Exhaust Fan Section

Not Fit For Purpose Intake

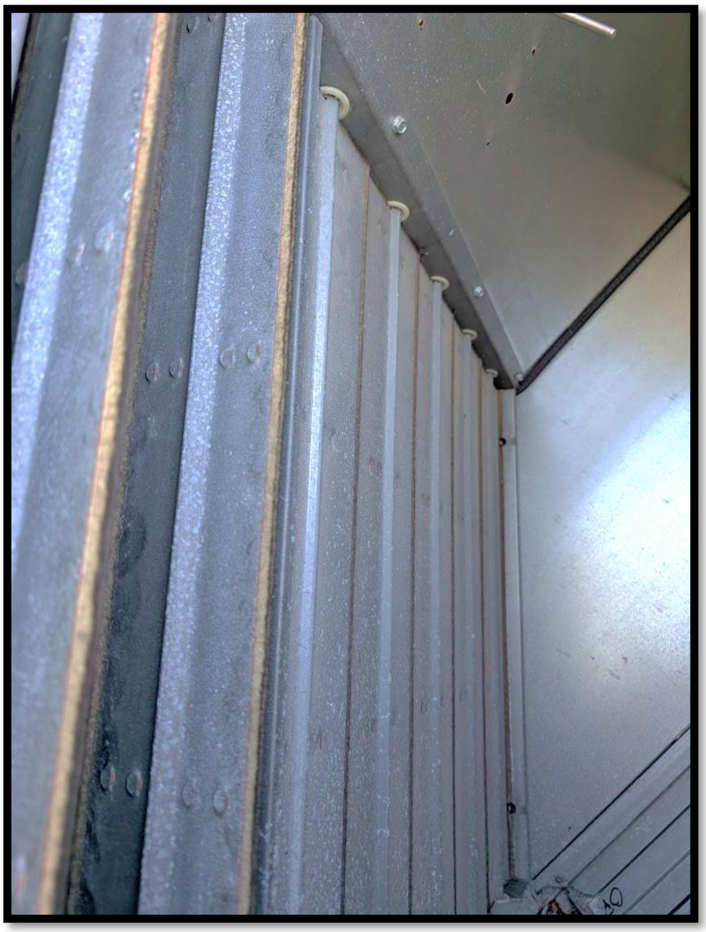


Electric Heater Battery Corrosion

Roof Deterioration/Corrosion

Weathered Isolator

Corroded Containment



Microbial Growth on Heat Exchanger

Conclusion

AHU04 – Restaurant

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Multiple components—including the heating coils, belt-driven fans, electric heater battery, and plate heat exchanger—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU04 is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU04 – Restaurant

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake Section

- Retrofit appropriate access and inspection panels to facilitate routine maintenance.
- Replace the existing droplet eliminator with a compliant weather louvre to prevent water ingress and meet Irish Building Regulations Part F.
- Install a protective cowl to shield the intake from prevailing wind-driven rain and airborne contaminants.

Intake Dampers

- Confirm BMS integration and modulation capability of the dampers.
- Replace or refurbish weathered actuators to ensure reliable operation.
- Retrofit access panels to allow safe inspection and maintenance of damper mechanisms.

Panel Filter Wall

- Treat or replace corroded filter frames.
- Monitor for seasonal waterlogging and ensure drainage is sufficient to prevent microbial growth.
- Consider upgrading to higher-efficiency synthetic filters with lower pressure drops and better moisture resistance.

Electric Heater Battery

- Replace the existing EHB due to widespread corrosion.
- Reposition the downstream filter wall to achieve a minimum clearance of 300 mm in line with international safety guidance.
- Install airflow interlocks and high-temperature cut-outs.
- Upgrade to a modern, energy-efficient EHB with the same thermal output and reduced energy consumption.

Plate Heat Exchanger

- Replace the existing heat exchanger and integral damper due to microbial contamination and substandard thermal efficiency (52% vs. 67–73% required by EU Ecodesign/Irish regulations).
- Install a high-efficiency plate heat exchanger capable of achieving ≥75% efficiency to meet current compliance standards and reduce energy costs.

Heating Coil

- Replace the heating coil due to corrosion and fin brittleness, with output now reduced by up to 40%.
- Select a modern replacement coil with matching capacity and improved corrosion resistance, especially given the coastal environment.

Bag Filters

- Treat or replace corroded filter frames.
- Upgrade to F7 / ISO ePM1 60% synthetic bag filters with low initial pressure drop and high dust-holding capacity.
- Implement a regular inspection and replacement schedule to ensure filtration efficiency and minimise pressure drop.

Supply Fan Section

- Replace the existing 5.5 kW belt-driven fan with a modern EC fan system.
- Select corrosion-resistant fan components suitable for coastal environments.
- The EC upgrade will eliminate belt losses, reduce energy consumption, and minimise maintenance requirements.

Exhaust Fan Section

- Replace the existing 5.5 kW belt-driven exhaust fan with a corrosion-resistant EC fan system.
- This upgrade will restore airflow capacity, enhance reliability, and reduce mechanical and energy losses.

Electrical Containment

- Fully replace all electrical containment systems, including sensors, actuators, isolators, trunking, and cabling.
- Use IP-rated, UV- and weather-resistant components suited for rooftop environments.

Roof

- Replace or repair damaged insulation and corroded metal cladding.
- Apply weather-resistant coatings to prevent further corrosion and restore thermal performance in accordance with CIBSE Guide M and Irish Building Regulations Part L.

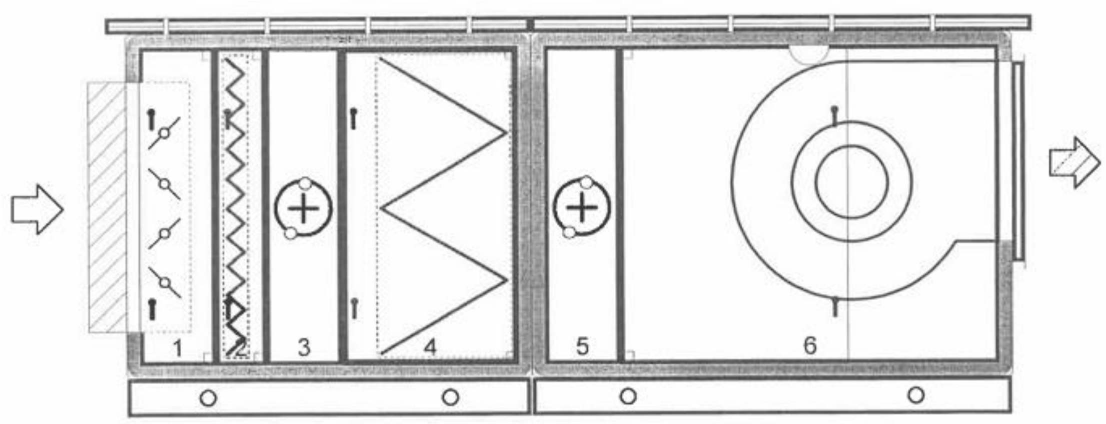
Doors & Panels

- Replace the damaged access door in full, including new hinges, latches, and gaskets rated for AHU applications, in line with EN 1886 casing integrity standards.
- Verify that the replacement door achieves the necessary pressure class and leakage performance to comply with CIBSE Guide M and Irish Building Regulations Part L.
- Implement a maintenance schedule for periodic inspection of all AHU access doors to prevent future mechanical failure or air leakage issues.

Condition

AHU05 – Kitchen

AHU drawing



Unit Overview:

This Air Handling Unit (AHU), manufactured by Fläkt approximately 22 years ago, is installed externally on the rooftop and was originally designed to deliver 5.65 m^3/s at 300 Pa for both supply air only.

The AHU includes a fresh air intake damper, LPHW frost coil, panel and bag filtration, belt-driven fans with associated motors, and heating coil.

During the inspection, the unit was found to be in poor external condition. Significant age-related deterioration was evident, particularly across the electrical containment systems, which show clear signs of degradation. Multiple access panels, along with the unit's roof structure, exhibit widespread corrosion. The main fan door hinges were broken with the panel being held up with a piece of timber. These issues raise concerns regarding potential water ingress, compromised insulation, and the overall structural integrity of the AHU casing.

At the intake section, the unit is fitted with an eliminator rather than a weather louvre. Typically, eliminators are positioned downstream of cooling coils to capture condensate carryover—not at the intake where rain and airborne moisture must be deflected. The absence of a dedicated weather louvre likely contributes to excessive moisture ingress, which appears to have accelerated internal corrosion throughout the AHU.

This configuration is not aligned with best practice for weather protection in externally mounted AHUs, particularly in exposed or high-precipitation environments. Retrofitting a proper weather louvre and addressing existing corrosion should be considered a priority to prevent further internal deterioration and to extend the serviceable life of the unit.

Intake Section:

Immediately downstream of the intake duct is an empty section that currently lacks any provision for maintenance access. As this area is the initial point of contact for incoming supply air—exposed to salt-laden air from the nearby Cork Harbour—it is particularly vulnerable to debris accumulation and corrosion over time.

Compounding this issue, the unit is not fitted with a weather louvre at the intake. Instead, a droplet eliminator has been installed, which is typically used downstream of cooling coils to capture condensate carryover, not as a primary barrier against rain or airborne moisture. This configuration does not align with best practice for weather protection and likely contributes to moisture ingress, further accelerating internal corrosion within the unit.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The actuator assemblies themselves are showing visible signs of weathering and age-related deterioration, potentially impacting their long-term reliability and control accuracy.

Panel Filter Wall:

This section contains:

- 6x 1/1 G3 filters

Immediately downstream there is a bank of G3 filters. The filters in place are rated for an initial pressure drop of 59Pa, with a recommended final pressure drop of 129Pa. While specific maintenance and replacement intervals have not been documented, all filters observed during the inspection appeared to be in generally good condition.

However, visible corrosion was noted on several filter frames. This deterioration is likely a result of prolonged exposure to salt-laden air from the nearby Cork Harbour, compounded by the absence of adequate weather protection in the upstream intake section. The corrosion presents a risk to both structural integrity and hygienic operation and will require either full frame replacement or appropriate corrosion treatment.

It is likely that these filters become waterlogged during certain times of the year, particularly during periods of high rainfall or humidity. This condition can lead to a range of operational issues within the AHU, including increased pressure drop, reduced airflow, microbial growth, and potential damage to downstream components.

Frost Coil

This heating coil is designed to raise the incoming air temperature from -3 °C to +3 °C, delivering a nominal heating output of 41 kW. However, the coil is now over 20 years old and displays clear signs of advanced deterioration, including corrosion, fin damage, and fouling — all of which are common in coastal environments such as Cork Harbour. Based on its current condition and the typical degradation rate of 20–40% over time, the effective heating capacity is now estimated to be approximately 24.6 kW, representing a performance loss of around 40%.

As the first line of frost protection for downstream components, this coil plays a critical role in preventing freezing within the system. Its degraded state presents a significant risk to operational reliability, particularly during colder months. In accordance with Irish Building Regulations Part L – Conservation of Fuel and Energy, heating systems must operate efficiently and deliver adequate thermal performance. A coil operating at nearly half its original output is unlikely to meet these requirements.

We strongly advise the full replacement of the heating coil. This should include replacement of the coil runners and housing, both of which are showing heavy corrosion and may compromise the structural support and seal integrity of the new installation. A modern, high-efficiency coil with corrosion-resistant materials should be specified, suitable for coastal applications, to ensure restored thermal performance, compliance with regulations, and reliable frost protection for the AHU system.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. The frames exhibit significant signs of rusting, requiring rust treatment, replacement and debris cleaning. We also recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

There are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Heating Coil

Next up we have the heating coil, with very brittle fins and corrosion throughout. The existing heating coil, rated at 150.5kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 90 kW of heating output. This is based at the higher end of a 40% degradation, given its current condition.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Supply Fan Section

The existing belt-driven supply fan and 11kW motor, manufactured in 2003, have been in continuous operation for over 22 years—exceeding the typical service life expectancy for such components. During the inspection, the fan housing, pulleys, and associated support structures showed significant signs of corrosion, particularly around fastenings and structural interfaces. This level of deterioration raises concerns regarding long-term mechanical reliability, alignment stability, and the potential for further degradation under load.

Corrosion of this nature can also lead to increased vibration, belt wear, and energy inefficiencies. Given the age and observed condition, replacement of the fan assembly with a modern, corrosion-resistant EC (electronically commutated) fan system is recommended to restore performance, improve efficiency, and reduce future maintenance risk.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Electrical containment

All electrical containment associated with this AHU requires full replacement due to extensive weather-related deterioration. Prolonged exposure to severe external conditions has resulted in widespread corrosion and physical damage across sensors, actuators, local isolators, cable trunking, and associated wiring.

Many components exhibit signs of water ingress, UV damage, and mechanical fatigue, posing serious risks to operational reliability and electrical safety. To ensure safe, compliant, and long-term functionality, we recommend a complete replacement of the electrical system—including all field devices, containment, and cabling—with weather-resistant, IP-rated components suitable for external environments.

Retrofit of Louvre and Cowel

The existing air intake arrangement for this rooftop AHU is not adequately designed to withstand prevailing weather conditions. The current setup lacks a proper weather louvre and protective cowl, relying instead on a non-compliant eliminator that does not provide sufficient defence against wind-driven rain, airborne debris, or salt-laden air—especially given the site's coastal exposure. As a result, the unit has been subject to repeated water ingress and corrosion, contributing to the deterioration of internal components and electrical systems.

In accordance with Irish Building Regulations Part F – Ventilation and best practice guidance such as CIBSE AM13 and DW/144 (HVAC Ductwork Specification), externally mounted AHUs must incorporate weatherproof intake designs, including louvres with adequate free area, drainage paths, and rain defence classification suitable for roof-level exposure. To meet these requirements and protect the longevity of the AHU, we strongly recommend the installation of a compliant weather louvre and external cowl. These additions will help prevent further water ingress, reduce internal corrosion, and ensure the unit meets modern standards for ventilation system resilience and weather protection.

Roof

The AHU roof structure exhibits clear signs of age-related deterioration, including visible corrosion, delamination of the external cladding, and damage to the underlying thermal insulation. Several areas show evidence of moisture ingress, likely due to long-term exposure to severe weather conditions and the breakdown of protective coatings and vapour barriers. This type of degradation compromises both the thermal performance and structural integrity of the unit, increasing the risk of water penetration, thermal bridging, and further corrosion over time.

In line with best practice outlined in CIBSE Guide M, DW/143 (Guide to Air Handling Units), and relevant sections of the Irish Building Regulations Part L – Conservation of Fuel and Energy, the thermal envelope of externally mounted AHUs must maintain adequate insulation continuity and weather resistance to prevent energy loss and material failure.

Doors and Access Panels

During the inspection, it was noted that the access door to the supply air section of the AHU had become detached from its hinges. The door was being held in place by a piece of timber leaned against it — a temporary and unsafe measure that indicates a complete failure of the original door hardware and frame. This condition raises multiple concerns from both a performance and safety perspective.

Firstly, an unsecured or poorly sealed access door leads to uncontrolled air leakage. This undermines the AHU's ability to maintain its designed static pressure, resulting in reduced airflow performance and increased fan energy consumption as the system compensates for the loss. Additionally, any gaps around the door can allow air to bypass critical components such as filters, heating, or cooling coils. This compromises indoor air quality, reduces thermal efficiency, and may lead to uneven or insufficient conditioning of supply air.

In environments such as Cork Harbour, where salt-laden air and high humidity are prevalent, an unsecured door also increases the risk of moisture and airborne contaminants entering the AHU. This can accelerate internal corrosion and contribute to microbial growth, further deteriorating system components.

There is also a clear safety issue. The use of timber to support the door is not compliant with mechanical safety standards and poses a direct hazard to maintenance personnel. Without proper mechanical fastening, the door is vulnerable to shifting or falling during operation, especially under the vibration and pressure variations typical of large air-handling units.

From a regulatory standpoint, this condition falls short of Irish Building Regulations Part L, which require that HVAC systems be designed and maintained to operate efficiently and without unnecessary losses. Furthermore, industry standards such as CIBSE Guide B2, CIBSE Guide M, and EN 1886 (which governs AHU mechanical performance) all specify the importance of structurally sound, sealed, and secure access doors to prevent air leakage and ensure safe operation.

We recommend replacing the damaged access door in full, including new hinges, latches, and gaskets that meet industry performance and sealing standards. The surrounding panel and frame should also be inspected for structural damage. This remedial action will restore system integrity, reduce energy losses, prevent contamination, and ensure the safety of maintenance personnel in compliance with relevant standards and regulations.

Photos

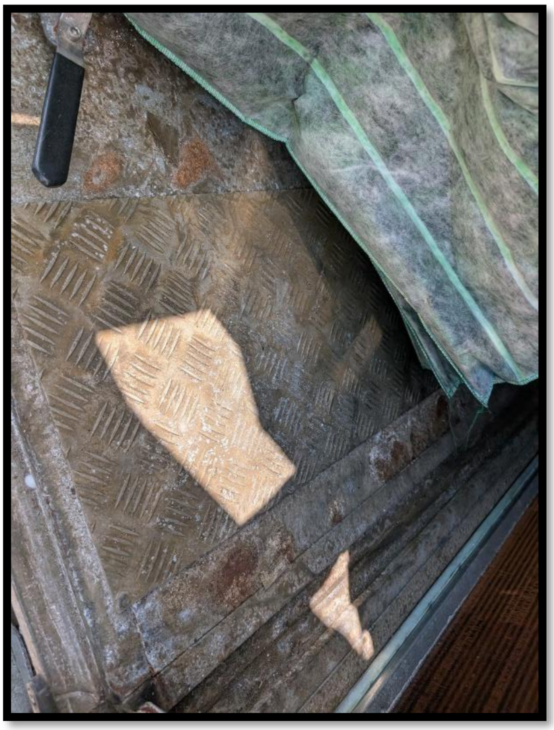
AHU05 – Kitchen

HALO HVAC

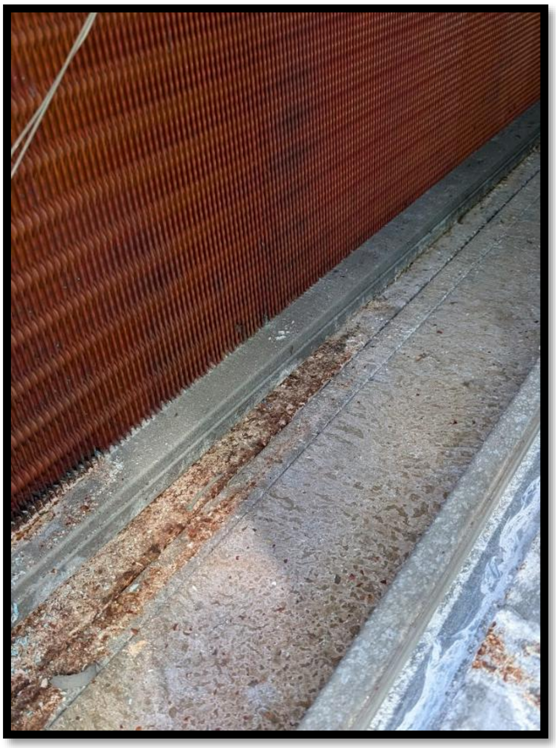
Door Unsecured

Intake Debris/Corrosion

Supply Fan Section

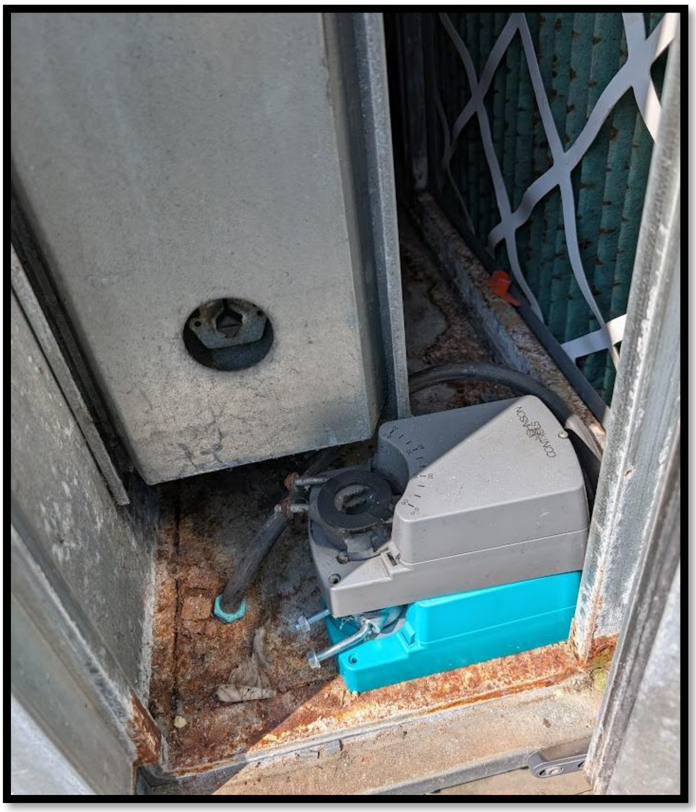


Fan Section Corrosion



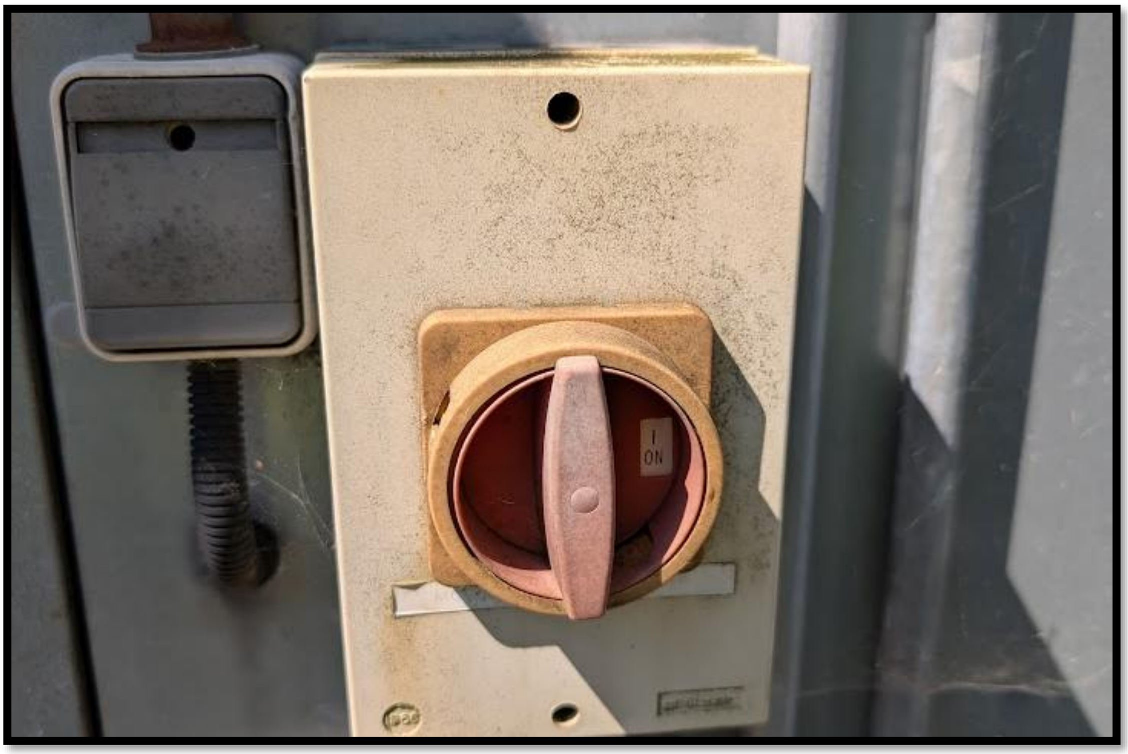
Heating Coil Corrosion

Corroded Filter Frames



Discharge Section Corroded. Damper Spindle Snapped

Intake Section Corroded



Weathered Electrical Containment

Signs of Water Logging in Bag Filters

Conclusion

AHU05 – Kitchen

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Multiple components—including the heating coils, belt-driven fans, and doors—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU05 is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU05 – Kitchen

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

Intake Section

- Retrofit appropriate access and inspection panels to facilitate routine maintenance.
- Replace the existing droplet eliminator with a compliant weather louvre to prevent water ingress and meet Irish Building Regulations Part F.
- Install a protective cowl to shield the intake from prevailing wind-driven rain and airborne contaminants.

Intake Dampers

- Confirm BMS integration and modulation capability of the dampers.
- Replace or refurbish weathered actuators to ensure reliable operation.
- Retrofit access panels to allow safe inspection and maintenance of damper mechanisms.

Panel Filter Wall

- Treat or replace corroded filter frames.
- Monitor for seasonal waterlogging and ensure drainage is sufficient to prevent microbial growth.
- Consider upgrading to higher-efficiency synthetic filters with lower pressure drops and better moisture resistance.

Frost & Heating Coil

- Replace the heating coil due to corrosion and fin brittleness, with output now reduced by up to 40%.
- Select a modern replacement coil with matching capacity and improved corrosion resistance, especially given the coastal environment.

Bag Filters

- Treat or replace corroded filter frames.
- Upgrade to F7 / ISO ePM1 60% synthetic bag filters with low initial pressure drop and high dust-holding capacity.
- Implement a regular inspection and replacement schedule to ensure filtration efficiency and minimise pressure drop.

Supply Fan Section

- Replace the existing belt-driven fan with a modern EC fan system.
- Select corrosion-resistant fan components suitable for coastal environments.
- The EC upgrade will eliminate belt losses, reduce energy consumption, and minimise maintenance requirements.

Electrical Containment

- Fully replace all electrical containment systems, including sensors, actuators, isolators, trunking, and cabling.
- Use IP-rated, UV- and weather-resistant components suited for rooftop environments.

Roof

- Replace or repair damaged insulation and corroded metal cladding.
- Apply weather-resistant coatings to prevent further corrosion and restore thermal performance in accordance with CIBSE Guide M and Irish Building Regulations Part L.

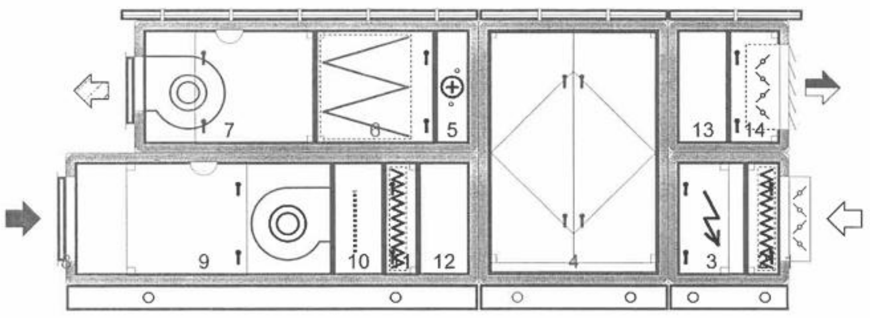
Doors & Panels

- Replace the damaged access door in full, including new hinges, latches, and gaskets rated for AHU applications, in line with EN 1886 casing integrity standards.
- Inspect and repair any damage to the surrounding panel or frame to ensure a proper airtight seal and structural integrity.
- Eliminate the use of temporary supports (e.g. timber props), which present a serious safety hazard and are non-compliant with mechanical safety and building standards.
- Verify that the replacement door achieves the necessary pressure class and leakage performance to comply with CIBSE Guide M and Irish Building Regulations Part L.
- Implement a maintenance schedule for periodic inspection of all AHU access doors to prevent future mechanical failure or air leakage issues.

Condition

AHU10 – Block A Toilets

AHU drawing



Unit Overview:

This Air Handling Unit (AHU), manufactured by Fläkt approximately 22 years ago, is installed externally on the rooftop and was originally designed to deliver 1.02 m³/s at 300 Pa for supply air and 1.20 m³/s at 300Pa on the exhaust side. The AHU includes a fresh air intake damper, EHB, panel and bag filtration, belt-driven fans with associated motors, and heating coil.

During the inspection, the unit was found to be in poor external condition. Significant age-related deterioration was evident, particularly across the electrical containment systems, which show clear signs of degradation. Multiple access panels, along with the unit’s roof structure, exhibit widespread corrosion.

At the intake section, the unit is fitted with an eliminator rather than a weather louvre. Typically, eliminators are positioned downstream of cooling coils to capture condensate carryover—not at the intake where rain and airborne moisture must be deflected. The absence of a dedicated weather louvre likely contributes to excessive moisture ingress, which appears to have accelerated internal corrosion throughout the AHU.

This configuration is not aligned with best practice for weather protection in externally mounted AHUs, particularly in exposed or high-precipitation environments. Retrofitting a proper weather louvre and addressing existing corrosion should be considered a priority to prevent further internal deterioration and to extend the serviceable life of the unit.

It is advisable to assess whether the services supplying the LPHW heating coil are adequately sized and performing as intended. The Electric Heater Battery (EHB) appears to be oversized, which may indicate that the LPHW system is unable to meet the required thermal duty. This could be due to insufficient flow rates, undersized pipework, or limitations within the heat source itself. A detailed investigation into the LPHW system's capacity and performance is recommended to determine whether it can reliably support the coil's design load or if supplementary heating is compensating for a shortfall.

Intake Section:

Immediately downstream of the intake duct is an empty section that currently lacks any provision for maintenance access. As this area is the initial point of contact for incoming supply air—exposed to salt-laden air from the nearby Cork Harbour—it is particularly vulnerable to debris accumulation and corrosion over time.

Compounding this issue, the unit is not fitted with a weather louvre at the intake. Instead, a droplet eliminator has been installed, which is typically used downstream of cooling coils to capture condensate carryover, not as a primary barrier against rain or airborne moisture. This configuration does not align with best practice for weather protection and likely contributes to moisture ingress, further accelerating internal corrosion within the unit.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The actuator assemblies themselves are showing visible signs of weathering and age-related deterioration, potentially impacting their long-term reliability and control accuracy.

Panel Filter Wall:

This section contains:

- 6x 1/1 G3 filters

Immediately downstream of the Electric Heater Battery (EHB) is a panel filter wall. The filters in place are rated for an initial pressure drop of 59Pa, with a recommended final pressure drop of 129Pa. While specific maintenance and replacement intervals have not been documented, all filters observed during the inspection appeared to be in generally good condition.

However, visible corrosion was noted on several filter frames. This deterioration is likely a result of prolonged exposure to salt-laden air from the nearby Cork Harbour, compounded by the absence of adequate weather protection in the upstream intake section. The corrosion presents a risk to both structural integrity and hygienic operation and will require either full frame replacement or appropriate corrosion treatment.

It is likely that these filters become waterlogged during certain times of the year, particularly during periods of high rainfall or humidity. This condition can lead to a range of operational issues within the AHU, including increased pressure drop, reduced airflow, microbial growth, and potential damage to downstream components.

Electric Heater Battery (EHB):

The galvanised steel enclosure of the EHB is corroded throughout. It is designed to raise incoming air from 5.3 °C to 24.7°C, providing frost protection for all downstream components. It delivers a total heating capacity of 24kW. These duties seem a little high, and therefore we would assume that the EHB is also being utilised for heating to serve the environment rather than exclusively being a source of frost protection to the AHU itself. It is worthwhile identifying any temperature complains within the occupied space this AHU serves.

Concerningly the EHB is currently installed with only 150 mm clearance from cardboard panel filters.

While there is no specific Irish regulation mandating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidance generally recommend a minimum clearance of 300 mm.

This spacing is essential to:

- Prevent filter overheating
- Reduce fire risk, especially with synthetic or combustible media
- Ensure uniform airflow and prevent hot spots that could damage components

Additional Best Practices:

- Where reduced spacing is unavoidable, use non-combustible or metal-framed filters
- Include airflow interlocks and high-temperature cut-outs for safety

We recommend replacing the existing EHB and repositioning the panel work to provide a clearance exceeding 300 mm, ensuring full compliance with international fire safety and operational efficiency standards. Furthermore, we advise upgrading to a modern, energy-efficient EHB capable of delivering the same heating output with lower power consumption, thereby improving system performance and reducing operational costs.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 1°C, and an exhaust air range of 21 °C down to 10.1 °C. It provides 16kW of heat recovery, equating to a thermal efficiency of 54%.

The heat exchanger its self is laden with spores of microbial growth due to lack of maintenance and poor AHU design. Furthermore the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m³/h—this unit operates well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Heating Coil

Next up we have the heating coil, with very brittle fins and corrosion throughout. The existing heating coil, rated at 16kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering only 9.6kW of heating output. This is based at the higher end of a 40% degradation, given its current condition.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. The frames exhibit significant signs of rusting, requiring rust treatment, replacement and debris cleaning. We also recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

There are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply Fan Section

The existing belt-driven supply fan and 2.20kW motor, manufactured in 2003, have been in continuous operation for over 22 years—exceeding the typical service life expectancy for such components. During the inspection, the fan housing, pulleys, and associated support structures showed significant signs of corrosion, particularly around fastenings and structural interfaces. This level of deterioration raises concerns regarding long-term mechanical reliability, alignment stability, and the potential for further degradation under load.

Corrosion of this nature can also lead to increased vibration, belt wear, and energy inefficiencies. Given the age and observed condition, replacement of the fan assembly with a modern, corrosion-resistant EC (electronically commutated) fan system is recommended to restore performance, improve efficiency, and reduce future maintenance risk.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Exhaust Fan Section

The exhaust fan section shares the same power absorption as the supply fan, with slightly different airflow and pressure specifications. The exhaust achieves slightly greater airflow than supply. It also exhibits similar age-related deterioration and operational inefficiencies. In line with the recommendations for the supply fans, we advise replacing the existing belt-driven exhaust fans with high-efficiency EC (electronically commutated) fans to improve reliability, reduce energy consumption, and eliminate ongoing belt maintenance requirements.

Electrical containment

All electrical containment associated with this AHU requires full replacement due to extensive weather-related deterioration. Prolonged exposure to severe external conditions has resulted in widespread corrosion and physical damage across sensors, actuators, local isolators, cable trunking, and associated wiring.

Many components exhibit signs of water ingress, UV damage, and mechanical fatigue, posing serious risks to operational reliability and electrical safety. To ensure safe, compliant, and long-term functionality, we recommend a complete replacement of the electrical system—including all field devices, containment, and cabling—with weather-resistant, IP-rated components suitable for external environments.

Retrofit of Louvre and Cowel

The existing air intake arrangement for this rooftop AHU is not adequately designed to withstand prevailing weather conditions. The current setup lacks a proper weather louvre and protective cowl, relying instead on a non-compliant eliminator that does not provide sufficient defence against wind-driven rain, airborne debris, or salt-laden air—especially given the site's coastal exposure. As a result, the unit has been subject to repeated water ingress and corrosion, contributing to the deterioration of internal components and electrical systems.

In accordance with Irish Building Regulations Part F – Ventilation and best practice guidance such as CIBSE AM13 and DW/144 (HVAC Ductwork Specification), externally mounted AHUs must incorporate weatherproof intake designs, including louvres with adequate free area, drainage paths, and rain defence classification suitable for roof-level exposure. To meet these requirements and protect the longevity of the AHU, we strongly recommend the installation of a compliant weather louvre and external cowl. These additions will help prevent further water ingress, reduce internal corrosion, and ensure the unit meets modern standards for ventilation system resilience and weather protection.

Roof

The AHU roof structure exhibits clear signs of age-related deterioration, including visible corrosion, delamination of the external cladding, and damage to the underlying thermal insulation. Several areas show evidence of moisture ingress, likely due to long-term exposure to severe weather conditions and the breakdown of protective coatings and vapour barriers. This type of degradation compromises both the thermal performance and structural integrity of the unit, increasing the risk of water penetration, thermal bridging, and further corrosion over time.

In line with best practice outlined in CIBSE Guide M, DW/143 (Guide to Air Handling Units), and relevant sections of the Irish Building Regulations Part L – Conservation of Fuel and Energy, the thermal envelope of externally mounted AHUs must maintain adequate insulation continuity and weather resistance to prevent energy loss and material failure.

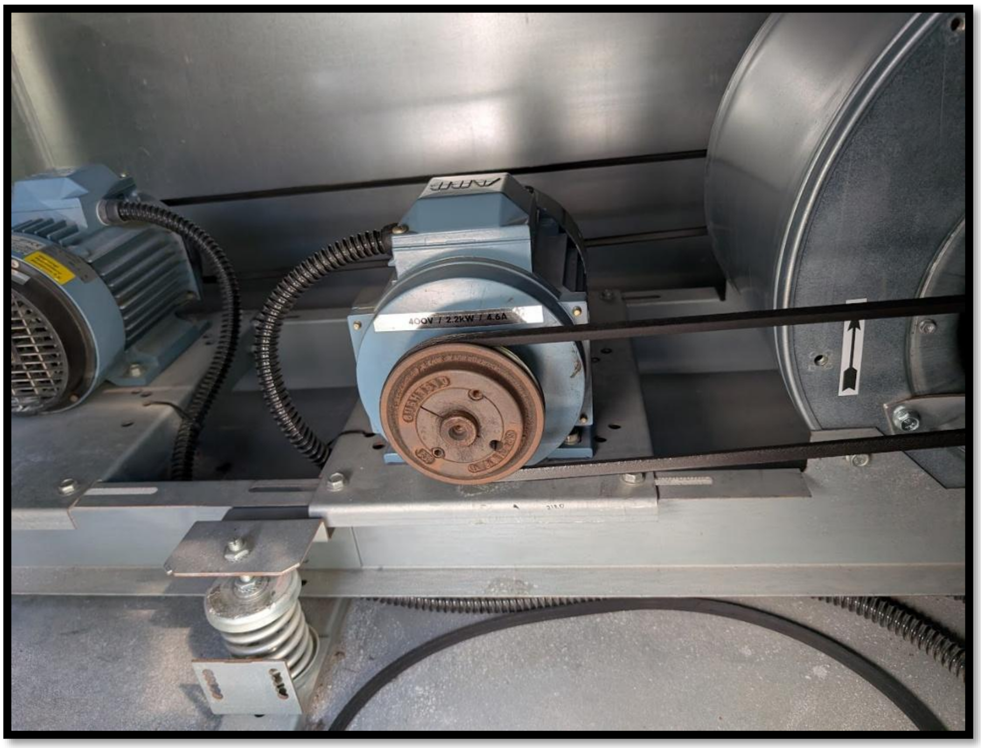
Doors and Access Panels

From a regulatory standpoint, this condition falls short of Irish Building Regulations Part L, which require that HVAC systems be designed and maintained to operate efficiently and without unnecessary losses. Furthermore, industry standards such as CIBSE Guide B2, CIBSE Guide M, and EN 1886 (which governs AHU mechanical performance) all specify the importance of structurally sound, sealed, and secure access doors to prevent air leakage and ensure safe operation.

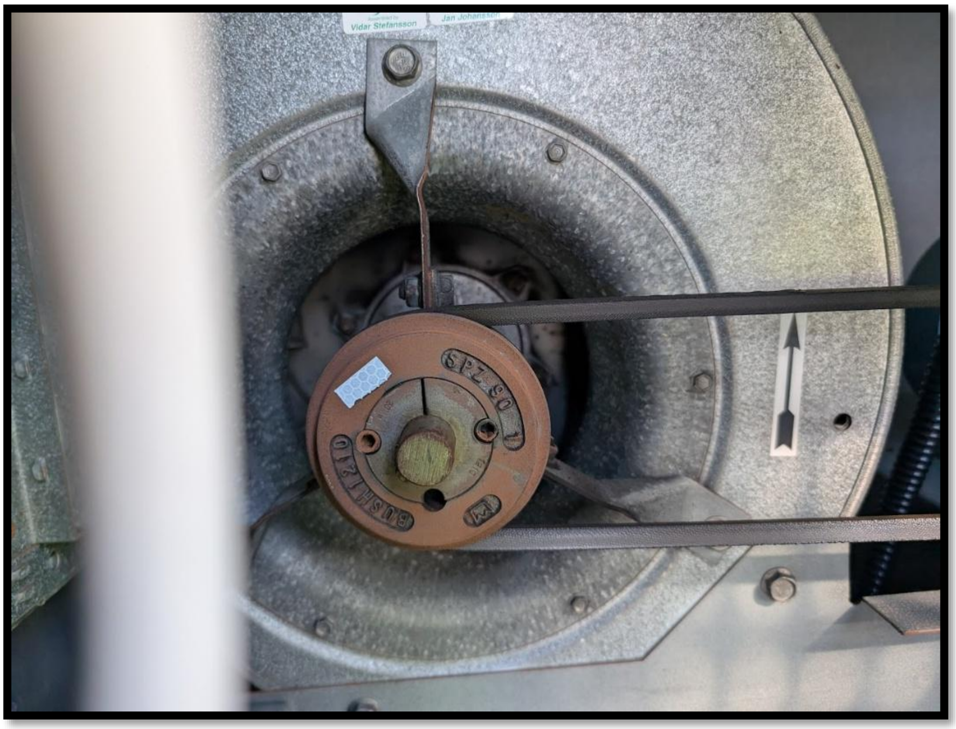
We recommend replacing the access doors in full, including new hinges, latches, and gaskets that meet industry performance and sealing standards. The surrounding panel and frame should also be inspected for structural damage. This remedial action will restore system integrity, reduce energy losses, prevent contamination, and ensure the safety of maintenance personnel in compliance with relevant standards and regulations.

Photos

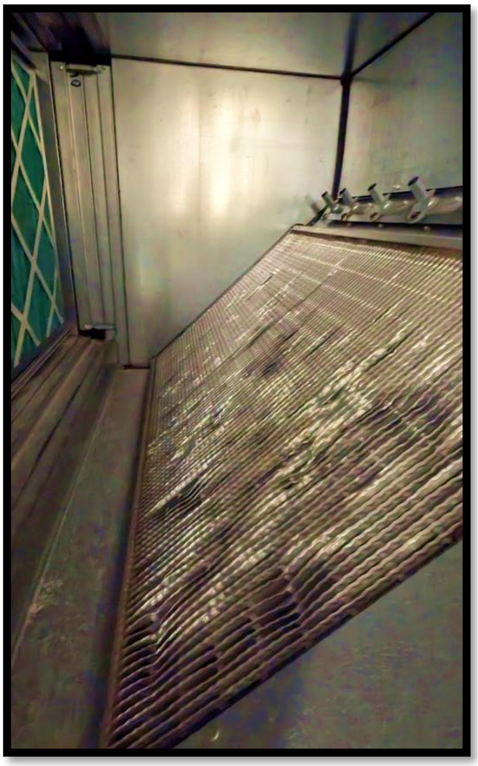
AHU10 – Block A Toilets



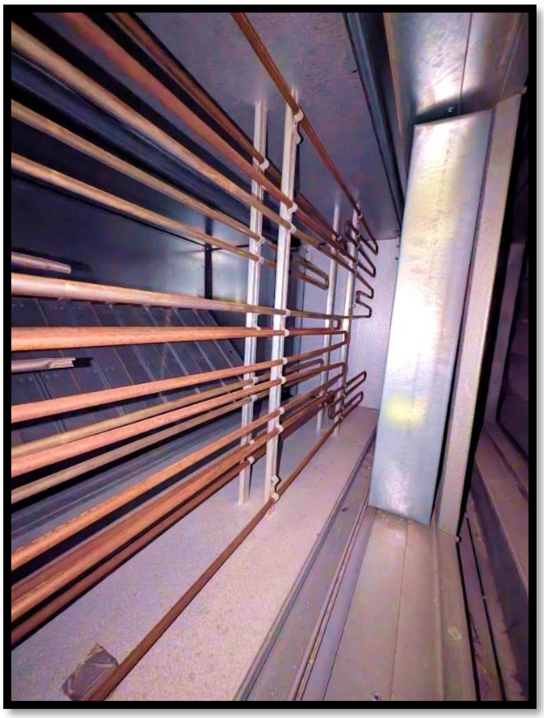
Exhaust Fan



Supply Fan



Heat Exchanger



Corroded EHB

Corrosion

Weathered Isolators

Conclusion

AHU10 – Block A Toilets

- 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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Multiple components—including the heating coils, belt-driven fans, and doors—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU10 is a perfect candidate for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

HALO HVAC

Recommendations

AHU10 – Block A Toilets

Intake Section

- Retrofit a compliant weather louvre and external cowl to prevent moisture ingress and meet Irish Building Regulations Part F.
- Remove the incorrectly positioned eliminator and replace with proper weather protection suitable for rooftop AHUs.
- Install drainage provisions in line with DW/144 to manage water ingress.
- **Maintenance Access:** Install appropriate access and inspection panels downstream of the intake duct and at the damper section to allow safe, routine maintenance.
- Ensure all access points comply with safe maintenance practices and mechanical safety standards.

Intake Dampers

- Replace or refurbish ageing actuators showing signs of deterioration.
- Confirm and, if necessary, enable BMS integration for modulating control.
- Test and recalibrate damper operation to ensure reliable airflow regulation.

Bag Filters

- Replace corroded panel filter frames and inspect surrounding housing for moisture damage.
- Consider upgrading to higher-efficiency synthetic panel filters to reduce pressure drop and improve energy efficiency.
- Replace rusted bag filter frames and switch to ISO ePM1 60% (F7) synthetic bag filters with Eurovent A+ energy ratings.
- Establish regular inspection and replacement intervals to prevent microbial growth and waterlogging.

Electric Hetare Battery

- Replace the corroded EHB unit with a modern, energy-efficient model featuring corrosion-resistant construction.
- Reconfigure the filter wall to provide ≥300 mm clearance between the EHB and filters, as recommended by manufacturers and fire safety guidance.
- Include airflow interlocks and high-temperature cut-outs for enhanced safety.
- Assess whether the EHB is oversized due to insufficient LPHW coil output; if so, review and address LPHW performance shortfalls.

Heating Coil

- Replace the existing 22-year-old coil showing signs of corrosion and output degradation.
- Verify that supply flow rates and heat input are sufficient to meet design duty; investigate potential under sizing or delivery issues with the LPHW system. (this may be a design fault via Flakt) and the existing LPHW services are good.

Heat Exchanger

- Replace the epoxy-coated plate heat exchanger due to microbial growth and substandard thermal efficiency (54%).
- Install a new high-efficiency plate heat exchanger achieving ≥75% recovery, compliant with EU Ecodesign 2016/2281 and Irish Building Regulations.
- Replace associated dampers to ensure proper airflow control and sealing.

Supply & Exhaust Fan Sections

- Replace the existing belt-driven fan with a modern EC fan system.
- Select corrosion-resistant fan components suitable for coastal environments.
- The EC upgrade will eliminate belt losses, reduce energy consumption, and minimise maintenance requirements.

Electrical Containment

- Fully replace all electrical containment systems, including sensors, actuators, isolators, trunking, and cabling.
- Use IP-rated, UV- and weather-resistant components suited for rooftop environments.

Roof

- Replace or repair damaged insulation and corroded metal cladding.
- Apply weather-resistant coatings to prevent further corrosion and restore thermal performance in accordance with CIBSE Guide M and Irish Building Regulations Part L.

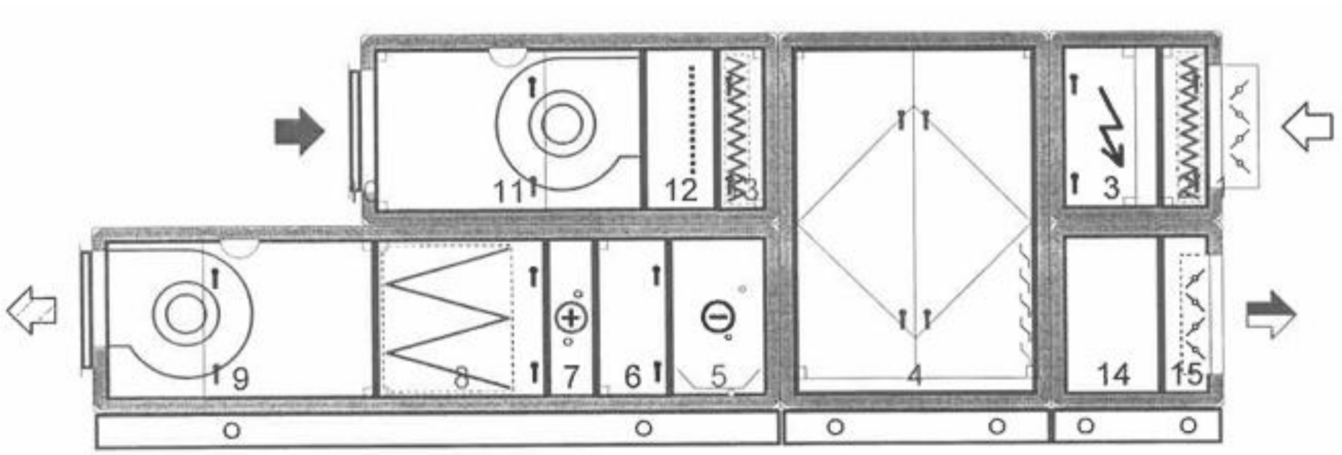
Doors & Panels

- Replace the damaged access door in full, including new hinges, latches, and gaskets rated for AHU applications, in line with EN 1886 casing integrity standards.
- Inspect and repair any damage to the surrounding panel or frame to ensure a proper airtight seal and structural integrity.
- Verify that the replacement door achieves the necessary pressure class and leakage performance to comply with CIBSE Guide M and Irish Building Regulations Part L.
- Implement a maintenance schedule for periodic inspection of all AHU access doors to prevent future mechanical failure or air leakage issues.

Condition

AHU07 – Lecture Theatre

AHU drawing



Unit Overview:

This AHU, manufactured by Flakt approximately 22 years ago, is located internally within an upper level internal plantroom and was originally designed to achieve 1.6m³/s @ 300Pa for Supply Air and 1.6m³/s @ 300Pa for Exhaust Air.

The AHU consists of a fresh air inlet damper, electric frost coil, panel and bag filters, two belt driven fan and motors, Heating & Cooling coils and Heat Exchanger. Externally the unit appears to be in good condition. There doesn't appear to have been any major repairs or retrofits along any section.

Overall, the unit appears to be in good condition. However, it is currently operating at only 20% of its design capacity, as limited by the local inverters. A detailed investigation is recommended to determine the rationale behind this reduced operating duty, assess whether it reflects current system requirements, and evaluate any potential impacts on ventilation performance, energy efficiency, or compliance with design intent.

Intake Section:

Immediately downstream of the intake duct is an empty section with no provision for maintenance access. As this is the first contact point for incoming supply air—exposed to salt-laden air from nearby Cork Harbour—there is a significant risk of debris accumulation and corrosion. We recommend a detailed intrusive inspection of this area, followed by retrofitting appropriate access and inspection panels to facilitate ongoing maintenance.

Intake Dampers:

Downstream of the intake duct are the intake dampers, controlled by an external actuator and interlocked with fan operation. It remains unclear whether these dampers are also capable of modulation via the BMS. As the upstream intake section, there is no provision for maintenance access. We recommend a detailed intrusive inspection of this area and the retrofitting of appropriate access and inspection panels to ensure safe and effective maintenance. The Dampers appeared to function correctly during local isolation and when switching on the fans.

Panel Filter Wall:

This section contains:

- 2x 1/1 G3 filters
- 3x ½ G3 filters

Closely following the EHB there is a panel filter wall. The filters are rated for an initial pressure drop of 48 Pa, with a recommended final pressure drop of 112 Pa. Although the maintenance and replacement intervals are not clearly defined, all filters inspected were in relatively good condition.

The observed corrosion on the filter frames is likely due to salt-laden air from the nearby Cork Harbour. This corrosion necessitates either frame replacement or appropriate rust treatment. Additionally, higher-efficiency panel filters should be evaluated to reduce airflow resistance and enhance fan performance.

Electric Heater Battery (EHB):

Going from intake to discharge, next is the electric heater battery (EHB). It is designed to raise incoming air from -3 °C to 5.3 °C, providing frost protection for all downstream components. It delivers a total heating capacity of 16kW. While this may appear modest, it is appropriately sized given the average winter temperatures at Cork Harbour, which range from 8 °C to 10 °C during the day and 2 °C to 5 °C at night (December to February). Frost occurrence is infrequent due to the coastal influence of the nearby Atlantic Ocean.

Concerningly the EHB is currently installed with only 150 mm clearance from cardboard panel filters.

While there is no specific Irish regulation mandating minimum separation distances between electric heater batteries and panel filters, international standards and manufacturer guidance generally recommend a minimum clearance of 300 mm.

This spacing is essential to:

- Prevent filter overheating
- Reduce fire risk, especially with synthetic or combustible media
- Ensure uniform airflow and prevent hot spots that could damage components

Additional Best Practices:

- Where reduced spacing is unavoidable, use non-combustible or metal-framed filters
- Include airflow interlocks and high-temperature cut-outs for safety

We recommend replacing the existing EHB and repositioning the panel work to provide a clearance exceeding 300 mm, ensuring full compliance with international fire safety and operational efficiency standards. Furthermore, we advise upgrading to a modern, energy-efficient EHB capable of delivering the same heating output with lower power consumption, thereby improving system performance and reducing operational costs.

Plate Heat Exchanger:

Next in the airflow path is an epoxy-coated heat exchanger, operating within a supply air temperature range of -3 °C to 9.3 °C, and an exhaust air range of 21 °C down to 8.8 °C. It provides 23.8kW of heat recovery, equating to a thermal efficiency of 51.2%.

While the unit appears to be in good physical condition, the calculated efficiency falls significantly below current regulatory requirements. Under EU Ecodesign Regulation (EU 2016/2281) and Irish Building Regulations, the minimum thermal efficiency for heat recovery systems in ventilation units is:

≥ 67% for all systems (baseline)
≥ 73% for plate heat exchangers

These requirements apply to non-residential AHUs with an airflow rate exceeding 250 m^3/h—this unit operates well above that threshold.

We recommend replacing the existing heat exchanger and integral damper to ensure compliance with current regulations. A modern, high-performance unit is expected to achieve efficiencies exceeding 75%, improving energy recovery, reducing operational costs, and aligning with sustainability and regulatory targets.

Cooling coil:

The existing cooling coil, rated at 21.3kW, is now 22 years old and likely operating well below its original design capacity. Industry data suggests that after two decades, cooling coils typically experience a 20% to 40% reduction in performance due to factors such as fin surface fouling, internal corrosion, and reduced airflow—especially in coastal environments like Cork Harbour where salt-laden air accelerates degradation.

For this coil, the effective cooling output may now be closer to 17.04 kW and 12.78 kW under typical conditions.

Given that the typical lifespan of a cooling coil is 15–20 years, and this unit has exceeded that range, replacement should be seriously considered. A new coil would not only restore full capacity but also offer improved efficiency, potentially lower pressure drops, and reduced energy consumption—making it a worthwhile investment in both performance and compliance.

Heating Coil:

Next up we have the heating coil, with very brittle fins. Again as the cooling coil: The existing heating coil, rated at 2.52kW, is also 22 years old and has likely experienced a notable reduction in output capacity. Over time, heating coils typically suffer from 20% to 40% degradation due to scale build-up, internal corrosion (especially in water-based systems), fin fouling, and diminished airflow. In a coastal environment like Cork Harbour, where salt-laden air can accelerate corrosion, performance loss may be even more pronounced.

As a result, this coil may now be delivering between 20.16 kW and 15.12 kW of effective heating.

Since heating coils generally have a service life of 15–20 years, this unit is operating beyond its expected lifespan. We recommend its replacement to restore full thermal capacity, improve energy efficiency, and reduce the risk of system failure during peak heating demand periods.

Bag Filters

Next in the system is a wall of F7 (EU7) bag filters. Both the filters and their frames appear to be in generally ok condition, requiring minor rust treatment and debris cleaning. However, we recommend exploring more energy-efficient alternatives that can maintain equivalent filtration performance while reducing pressure drop and operational costs.

Tthere are several modern options available that are well-suited to this setup. Specifically, we recommend upgrading to F7 / ISO ePM1 60% advanced synthetic bag filters. These filters offer:

- Low initial pressure drop, improving energy efficiency
- High dust-holding capacity, extending filter lifespan
- Reduced maintenance frequency
- Eurovent A+ energy rating
- Full compatibility with existing AHU filter sections

Upgrading to these high-efficiency filters would improve overall system performance, reduce fan energy demand, and lower total cost of ownership over time.

Supply and Exhaust Fan Section

The existing belt-driven fan and 3kW motor, manufactured in 2003, are now over 22 years old—well beyond the typical service life expectancy for such components.

As a result, the system is operating inefficiently, with a significant portion of the electrical input lost due to mechanical wear and reduced airflow output. Degradation in components such as belts, pulleys, bearings, and impellers over time leads to slippage, vibration, and loss of fan speed—all contributing to reduced system performance.

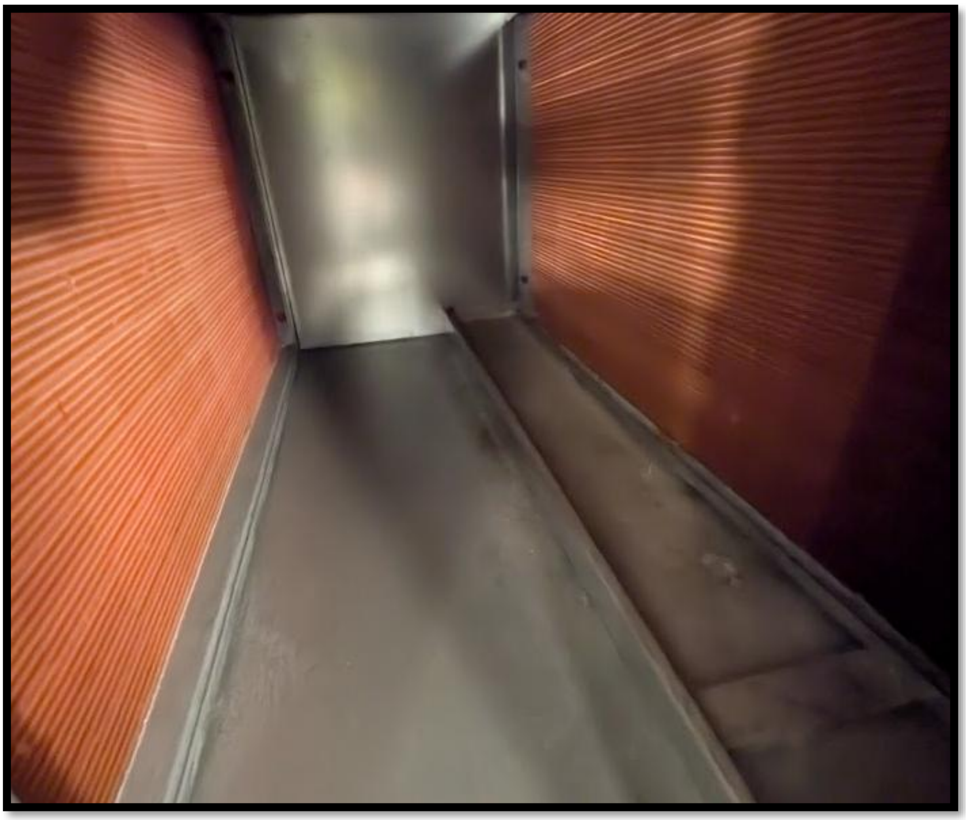
Given this level of underperformance and the age of the equipment, we recommend retrofitting the system with EC (electronically commutated) fans as soon as possible. EC fans offer superior energy efficiency, variable-speed control, and eliminate belt losses entirely, providing more precise airflow management and significantly lower power consumption.

This upgrade would restore full performance capability, improve reliability, reduce maintenance requirements, and result in long-term energy and cost savings.

Photos

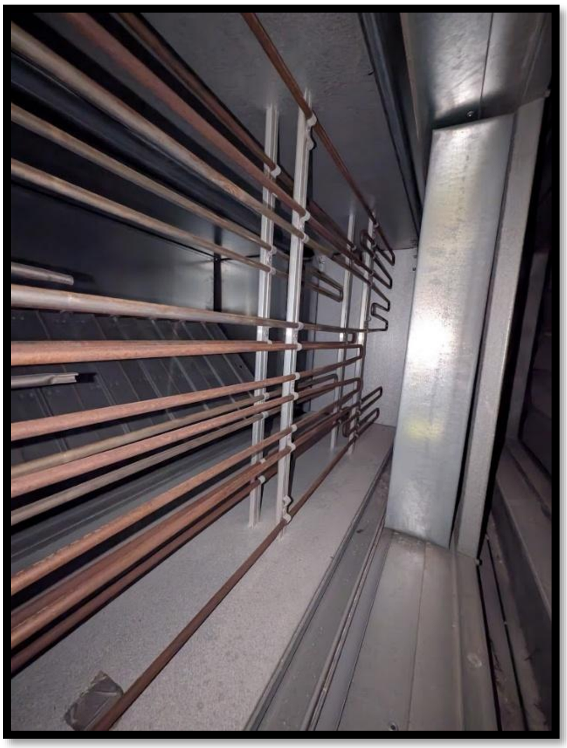
AHU07 – Lecture Theatre

Supply Fan Section



Heating & Cooling Section

Heat Exchanger



Electric Heater Battery

Bag Filters

Invertors Manually Set to Reduced Duty

Control Panel

Conclusion

AHU07 – Lecture Theatre

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.

The HALO Air Handling Unit (AHU) condition report reflects a consistent and accurate application of industry-standard methodologies as guided by CIBSE, RICS, and BESA. The unit, originally manufactured by Fläkt and now over 22 years in operation, has exceeded the indicative economic life expectancy as outlined in CIBSE Guide M, Appendix 12.A1. The detailed assessment carried out aligns with best practice guidance for engineering surveys (CIBSE Guide M 13) and asset condition classification principles set out in RICS NRM 3 and BESA SFG20.

Although the AHU remains structurally serviceable, multiple components—including the cooling and heating coils, belt-driven fans, electric heater battery, and plate heat exchanger—show signs of age-related degradation and are no longer compliant with modern EU Ecodesign (EU 2016/2281) and Irish Building Regulations (specifically Part L – Energy and Part F – Ventilation). The unit's performance has declined below acceptable thresholds, particularly in terms of energy recovery, air pressure output, and filtration efficiency. However, the unit is in very good condition.

From a Public Spending Code (PSC) and Office of Public Works (OPW) Governance Framework perspective, continued operation of outdated components is no longer cost-effective. A life cycle cost analysis supports a strategic programme of refurbishment—including EC fan retrofits, coil replacement, and filter upgrades—as a means to optimise long-term operational efficiency, safety, and compliance, rather than pursuing full unit replacement.

In summary, AHU07 could be for targeted refurbishment, not decommissioning. By replacing degraded components and upgrading key systems to modern equivalents, this AHU can be restored to full performance, and enhanced beyond its original design, ensuring regulatory compliance, reduced energy consumption, while extending the life of the asset in a cost-efficient and standards-aligned manner.

Recommendations

AHU07 – Lecture Theatre

By replacing aging components—many of which are over 22 years old and beyond their expected service life—and addressing localised issues with targeted treatment rather than full section replacement, you can restore efficiency, improve reliability, and ensure compliance, all while maximising return on existing infrastructure.

General Unit Condition & Operation

- Investigate why the AHU is operating at only 20% capacity as limited by the local inverters.
- Confirm whether current duty reflects actual building load or is compensating for mechanical or control limitations.

Intake Section

- Conduct a detailed intrusive inspection of the intake section for internal corrosion and debris buildup.
- Retrofit access and inspection panels to allow safe maintenance and internal cleaning.
- Evaluate salt-laden air exposure risks from Cork Harbour and apply protective coatings if necessary.

Intake Dampers

- Confirm whether dampers are modulating via the BMS; update or reconfigure as needed.
- Install access panels to allow inspection and maintenance of dampers and linkage mechanisms.

Panel Filter Wall

- Replace or treat corroded filter frames to restore structural integrity and hygiene.
- Consider upgrading to higher-efficiency synthetic panel filters to reduce pressure drop and improve fan performance.
- Implement a regular filter inspection and replacement schedule aligned with environmental exposure.

Electric Heater Battery

- Replace the EHB due to limited clearance (150 mm) from filters.
- Reposition panel work to ensure ≥300 mm clearance, complying with international fire safety guidance.
- Upgrade to a modern, energy-efficient EHB with airflow interlocks and high-temperature cut-outs.
- Where clearance remains constrained, use non-combustible or metal-framed filters.

Plate Heat Exchanger

- Replace the plate heat exchanger due to substandard thermal efficiency (51.2%) and non-compliance with EU Ecodesign Regulation (2016/2281).
- Install a new high-efficiency plate exchanger (≥75%) with corrosion-resistant surfaces and compliant integral damper.

Cooling Coil

- Replace the 22-year-old coil, as it is likely operating at just 60–80% of its original 21.3 kW capacity.
- Select a replacement coil with improved corrosion protection and lower pressure drop to optimise energy use.

Heating Coil

- Replace the heating coil, which is significantly degraded and no longer delivering full output (likely reduced to 15.12–20.16 kW from 25.2 kW).
- Ensure the replacement unit is designed for the site's coastal environment and suitable for the required thermal load.

Filter Bag Wall

- Treat minor rust and clean accumulated debris on existing frames.
- Upgrade to F7 / ISO ePM1 60% synthetic bag filters offering:
  - Low initial pressure drop
  - High dust-holding capacity
  - Eurovent A+ energy rating
  - Extended filter life and reduced maintenance

Supply and Exhaust Fan Section

- Replace both belt-driven fans and motors with EC (electronically commutated) fan assemblies.
- Benefits include:
  - Improved energy efficiency and airflow precision
  - Elimination of belt-related energy losses and maintenance
  - Reduced vibration, improved reliability, and lower lifecycle costs

Final Conclusion

Following a comprehensive inspection of these Air Handling Units at the National Maritime College of Ireland (NMCI), it is evident that while the AHUs remain structurally viable, the majority of critical components—namely fans, heat exchangers, coils, and filtration systems—have exceeded their service life thresholds per CIBSE Guide M. Their current operational efficiency falls significantly below modern standards, particularly under EU Ecodesign Regulation (EU 2016/2281) and the Irish Building Regulations (Part L – Energy & Part F – Ventilation).

The proposed refurbishment programme—focusing on the replacement of outdated belt-driven fans with EC (electronically commutated) fans, installing high-efficiency plate heat exchangers (≥75% efficiency), modernising both heating and cooling coils, and upgrading filtration to ISO ePM1 60% synthetic filters—presents a strategic opportunity to achieve substantial energy efficiency gains and reduce operational costs.

Estimated Energy Savings:

- EC Fans: Replacing belt-driven fans can reduce electrical consumption by up to 30–40%, saving an estimated 4–6 kW per AHU, depending on motor size.
- Heat Exchangers: Upgrading from sub-55% efficiency units to ≥75% can recapture an additional 5–8 kW of thermal energy per AHU.
- Coil Upgrades: Modern coils can improve heat transfer and reduce resistance, offering savings of 3–5 kW per AHU in heating and cooling loads.
- Advanced Filters: Switching to low-resistance, high-efficiency filters can reduce fan energy use by 1–2 kW per unit.

Combined, these upgrades can deliver an estimated total saving of 15–20 kW per AHU, with larger units at the upper end of the range. Applied across the full AHU estate, this translates to significant reductions in electricity and gas consumption, lowering carbon emissions by several tonnes per annum. A dedicated energy-saving feasibility report has been prepared to accompany this document, focusing specifically on the projected performance and return on investment of the proposed fan upgrades.

These upgrades are fully aligned with NMCI's commitment to the Munster Technological University 10-Year Sustainability Strategy, the European Green Deal, and Ireland's national climate targets, including the goal to reduce emissions by 51% by 2030 and achieve net-zero by 2050. As well as policies set out by Sustainable Energy Authority of Ireland (SEAI), and National Standards Authority of Ireland (NSAI).

Increased Asset Value:
Implementing the recommended refurbishments will significantly extend the economic life of the AHUs by 10–15 years, effectively resetting the depreciation curve. By integrating modern, energy-efficient components and ensuring full regulatory compliance, the units transition from end-of-life liabilities into performance-optimised, future-proof assets. This not only defers the need for capital-intensive full replacements but also improves lifecycle cost efficiency, operational reliability, and market valuation of the HVAC infrastructure—providing a measurable uplift in asset value across the estate.

Enhanced Indoor Air Quality and Occupant Wellbeing:
Upgrading to high-grade ISO ePM1 filters, optimising airflow with EC fan control, and restoring thermal balance through new coils and heat exchangers will dramatically improve indoor air quality across all served zones. These improvements will reduce airborne particulate concentrations, remove pathogens more effectively, and support stable temperature and humidity levels—creating a healthier, more comfortable indoor environment. This is particularly critical in mitigating viral transmission, supporting the building's resilience in the face of public health concerns such as influenza and COVID-19. Enhanced ventilation also contributes to improved cognitive performance, reduced absenteeism, and increased satisfaction for staff and students—while lowering indoor CO_2 concentrations and aligning with best practice from ASHRAE, WHO, and Irish Health and Safety Authority guidance.

Minimal Disruption and Downtime:
By upgrading key components in place, refurbishment allows facilities to maintain operations with minimal interruption while improving overall system performance. Unlike a full replacement—which often requires crane access, ductwork alterations, and extended system downtime—refurbishment can typically be carried out in stages, sometimes even while the AHU remains partially operational. Critical components such as fans, coils, dampers, and control panels can be individually upgraded or replaced within the existing unit casing, avoiding the need to dismantle or modify the surrounding infrastructure. This approach not only reduces project timelines and labour costs but also ensures that temperature-sensitive or mission-critical areas within the building—such as data centres, healthcare zones, or laboratories—continue to receive uninterrupted airflow. Additionally, targeted upgrades allow for the integration of modern technologies, such as variable speed drives or intelligent controls, which enhance responsiveness and operational precision without requiring a full system overhaul.

This report provides the technical and financial rationale needed to secure capital investment and should be used to guide funding allocation decisions in support of NMCI's operational resilience, regulatory compliance, environmental stewardship, and occupant wellbeing.

HALO HVAC - AHU condition reports are warrantable for the use of EU, Irish & UK 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.

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