Airedale by MODINE

HTM 03-01 (2021) Compliance

WHITEPAPER

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Contents

In industries where cooling is critical, you need a critical cooling specialist.

At Airedale, we recognise that air conditioning is vital in keeping an increasingly connected world up and running. At a time where sustainability is a particularly pressing matter for the future of our planet, we also strongly believe that air conditioning technology must be designed with environmental responsibility in mind.

Airedale is a global specialist in providing complete cooling solutions in industries where HVAC is mission-critical, including data centres, healthcare, telecommunications and pharmaceuticals. Our innovative products – which include chillers, close control and air handling units – are backed by intelligent software solutions, complete applications and service support.

With a strong R&D ethos rooted in sustainability and quality, Airedale's team of approximately 1000 employees is committed to providing products, services and solutions that enable our clients to meet their performance, efficiency and sustainability goals.

Based in Leeds (UK), Airedale also has facilities in Consett (UK), Guadalajara (Spain), Dubai (UAE), Rockbridge (US) and Grenada (US). Airedale is part of Modine (NYSE: MOD), a diversified global leader in thermal management technology and solutions.

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Synopsis

This whitepaper considers the key elements of HTM 03-01 (2021)[1] AHU compliance, reviewing the need behind the changes, including a review of the increasing awareness of indoor air quality and the impact it has on health and wellbeing.

The paper offers a broad overview of the changes and the impact of the updates made in 2021. It notes that whilst some of the changes may seem extreme and not reflective of the environment they serve, they are there to protect the wellbeing of service users, maximise efficiencies, reduce energy consumption and promote a standard of expertise and efficiency within the industry. The paper considers the requirement to engage with an HTM 03-01 expert for interpretation of the guidelines against the project requirements, especially if derogations might be applicable.

The paper also looks in detail at non-compliance, why some suppliers might claim to be compliant when the goods they supply do not meet the HTM guidelines. It offers advice on what to look to ensure your air handling units actually meet the specification you requested.

The paper considers the recurring theme of budget versus compliance and why this can leave customers with below-specification plant equipment and how this might happen inadvertently for the client, but usually deliberately by the supplier, as a means of reducing costs.

In this paper we also consider what the alternatives to HTM 03-01 compliance might look like, and this often takes a value engineered form to reduce cost. The paper considers when these value engineered options might be acceptable and what that could mean for a healthcare project.

The paper concludes with a response that the best practice for the NHS and other healthcare environments is to work with an HTM 03-01 specialist and ensure that corners are not cut, recognising this is unlikely to be the cheapest option available but is the safest for the wellbeing of service users and for maximising opportunities of future business within the NHS.

Introduction to HTM 03-01 (2021)

The understanding, interpretation and application of the health technical memorandum HTM 03-01 (2021) is a critical element of being able to deliver compliant, energy efficient and fit-for-purpose air handling units to the NHS and other healthcare and pharmaceutical environments.

Originally published in 2007, the 2021 update to the HTM 03-01 guidelines brings together the advice and recommendations from a wide range of building services engineers with specific interest in the healthcare sector, as well as many others involved in hospital ventilation, to offer best practice solutions. The updates cover areas such as:

- Standards and regulations including the eco-design directive for ventilation products (EU 1253/2014)and filtration standard ISO 16890
- Updated maintenance and service requirements
- Appropriate build materials to avoid corrosion, growth of microorganisms and condensation
- The implementation of energy efficient solutions for air movement, heat recovery and controls, covering newer technologies and highlights their importance in achieving a sustainable design for the system

Why is Airedale qualified to publish this white paper?

As a leading manufacturer of air handling units for the healthcare sector in the UK, we have a long history of experience and expertise in the application of HTM 03-01, and this is why we are trusted by so many healthcare providers. We work to the most stringent of standards, explaining our process, the HTM 03-01 specification and any suitable modifications to our clients, informing them at all times if any value-engineering alternatives are available, and crucially, what that would mean to their compliance to the HTM. This affords us the expertise and objectivity required to publish this paper, intended to be used as a reference document for healthcare suppliers, consultants, Directors of Estates, FM managers and mechanical and electrical contractors.

Publication of the revised HTM 03-01 (2021)

On the 22nd of June 2021, the revised Health Technical Memorandum (HTM) 03-01 (2021)1 – Specialised ventilation for healthcare buildings, was published by NHS England & NHS Improvement.

Developed with the support of a specialist healthcare construction team from CIBSE – the CIBSE Healthcare Group[2] – along with many other professional institutions and individuals involved in hospital ventilation, the HTM 03-01 (2021) document offers comprehensive advice and guidance for ventilation in healthcare.

This much anticipated revision has been well received by those in the industry keen to see the guidance being brought up to date with current legislation, standards, best available technologies, and modern methods of manufacturing.

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What is the HTM 03-01?

The Health Technical Memoranda (HTMs) are a series of documents published by the Department of Health and Social Care (DHSC)[3] which alongside the Health Building Notes (HBNs)[4] and Building Regulations Approved Documents[5] form the core guidance for the construction industry in the design and delivery of healthcare buildings in the United Kingdom.

The HTMs are comprised of many documents providing guidance for engineering technology used in the delivery of healthcare, with HTM 03-01 in particular considering the legal requirements, design, specification, installation, maintenance, and operation of ventilation systems in healthcare premises.

The HTM 03-01 is published in two parts; Part A considering the design, specification, installation, and initial acceptance of a healthcare ventilation systems, whilst Part B regards the maintenance, management, and operation of those same systems.

Part A applies to all new and refurbished installations, meaning these won't need to be updated until the time they are refurbished and Part B is applicable to all systems, irrespective of their age, meaning that existing installations should comply with the new requirements retrospectively.

Why revise the HTM 03-01 (2021)

The HTM 03-01 version from 2007 was undoubtedly due a refresh having been in circulation for nearly 14 years.

The prior document was outdated in terms of technologies, design and manufacturing methods, which are nowadays crucial to meet the increasing demand for energy efficient products that reduce waste and contribute to more demanding environmental targets. This includes the NHS and their own commitment to becoming the first carbon neutral national health service, by bringing their direct carbon emissions to net zero by 2040 (80% reduction by 2028 to 2032), and on their supply chain by 2045[6].

Adding to this, the hyper awareness about the importance of IAQ (indoor air quality) and intense scrutiny on ventilation in public places brought on by the COVID-19 pandemic, meant that the publication of the revised guidelines was, not only necessary, but fundamental to bring reassurance that future systems are designed and installed to a state-of-the-art standard.

As with any industry, a change in legislation or guidance always incurs additional work and causes disturbance in ongoing projects. Because these guidelines were issued without much notice and became immediately effective, it left the industry somewhat playing catch-up. However, the industry was ready for government regulators to revise their design approach – never had we seen so much interest from the public in ventilation and indoor air quality as we did following the coronavirus pandemic.

Indoor Air Quality

The discussion around Indoor Air Quality (IAQ) in public buildings and especially healthcare settings has been gaining traction for some time. The catastrophic effects of pollution are coming to the forefront, as we experience the impact of global warming worldwide and the stress that everyday local pollution puts on our health. In sensitive settings like healthcare, IAQ is an even more pressing topic.

Great Ormond Street Hospital, along with Global Action Plan, commissioned the Clean Air Hospital Framework[7] in 2018 to identify the issues faced in healthcare settings and look at strategies for reducing pollution, with one of the key focuses being on ventilation and air quality monitoring. The framework considers the need for improvements to the efficiencies of ventilation systems and considers the volume of fresh air against recirculated air, based on both the clinical environment (i.e. operating theatre versus reception area) as well as the pollution recorded in the geographical area. Also in 2018, another report was published by the British Lung Foundation called 'Toxic Air at the Door of the NHS'[8], which documented that 2220 GP surgeries and 248 hospitals in the UK are in locations with air pollution above World Health Organization Standards. Poor air quality has been the catalyst for greater discussion about the needs for adequate ventilation – natural or otherwise – and the Government, NHS and other associated regulatory bodies have rapidly got on board with this.

Covid-19

Good ventilation has been very well publicised by authority bodies as a method of reducing the opportunities for airborne transmission of Covid-19 and other contagious respiratory infections. We continue to see demand for advice, maintenance visits, service checks, refurbishments, and replacements on air handling units across the board, from office buildings to warehouses and hospitals to pharmaceutical laboratories.

Hospitals have to be mindful of infection control and effective ventilation has played a role in their strategy. Hospitals and other clinical settings often have the most physically vulnerable people in a concentrated area where the risk of airborne virus is possibly higher than average and have had to adapt existing facilities for this purpose.

Air handling units and ventilation in healthcare

Air handling units are the lungs of the healthcare building, providing fresh, clean, conditioned air to occupied spaces and removing and exhausting the contaminated air within.

Ventilation is crucial to the healthcare environment for several reasons. On a surface level, it provides a safe and comfortable environment for patients and staff by bringing in fresh air and controlling the air temperature, humidity, and odours through the building. Beyond that, it is also crucial to reduce airborne infection risks in critical areas of the building, where its purpose is to reduce bioburden, via filtration and dilution of the air, and working to maintain spaces at appropriate pressure to prevent ingress or egress of dangerous microorganisms. Mechanical ventilation is also critical in other healthcare associated facilities and may be used to ensure quality assurance compliance in pharmacies and sterile services departments, or to protect staff from harmful and toxic substances in laboratories.

The failure of air handling units in hospitals can have catastrophic consequences as, given the specialised nature of the services provided within the facilities, it is very difficult to readily provide equivalent service elsewhere. This can lead to reduced capacity of services in the building and, in the worst-case scenario, their cessation and potential loss of life as a result. Its therefore essential that these systems are built to offer resiliency in the event of component or system failure while providing suitable facilities for access and maintenance to facilitate resolving issues...and getting the system back to an operational status swiftly.

Air handling units also represent a significant portion of the total energy consumption in healthcare buildings and the design of ventilation systems should therefore take this into consideration by utilising, where possible, the best available, most energy efficient and sustainable technologies. These, aided by intelligent building management and local controls systems which accurately maintain the conditions in the space, along with a high-quality installation, commissioning and maintenance plan, will provide the maximum health benefits for the minimum energy input.

Image shows an Airedale HTM 03-01 compliant AHU

HTM 03-01 (2021) AHU mechanical design requirements

Whilst it is possible to summarise the bulk of the revisions to HTM 03-01 in a few paragraphs, it is important to either fully understand them or consult with a supplier who does, in order to make meaningful decisions as to how they might apply to a specific project.

Those already familiar with HTM documents will recognise there is not a one-size-fits-all approach to their implementation, and while this is a positive thing because it allows for environmental and economic factors specific to each project to be taken into consideration, it also leaves a lot of grey areas which are left open to interpretation and discussion.

Standards and legislation

Since the publication of the 2007 version, much has changed on the scope of legislation and standards for air handling units across the industry. The EcoDesign Directive for ventilation products (EU 1253/2014) came to force in 2016, compelling AHU manufacturers toward more energy efficient technologies and transparency in their technical documentation.

In 2018, filtration standards were updated with BS EN 779 being replaced with the new global filtration standard ISO 16890, which brought the classification of particulate air filters closer to their real-world applications and the WHO indoor air quality guidelines. In 2019 standard BS EN 1822 regarding the testing and classification of HEPA filters and BS EN 13053 on the rating and performance of air handling units have both been updated. The COVID pandemic in 2020 has brought increased concerns about ventilation and a general increase on the recommended air changes per hour in common public spaces. All these changes, amongst many others that took place in prior years, needed to be accommodated in the revised health technical memorandum.

Quality casing construction

A major area of concern is on the selection of appropriate build materials to prevent corrosion and the growth of microorganisms inside the air handling unit. The use of corrosion prone and degradable materials in air handling units can lead to a quick deterioration of the plant, accumulation of dirt and organic material inside, and the associated growth of microorganisms such as moulds and bacteria. These can be very threatening in a healthcare setting, especially for immunocompromised patients, such as those suffering from cancer or leukaemia, since moulds for example can be especially dangerous to these vulnerable patients[9] [10]. The new guidance requires that long lasting, non-corrodible, non-degradable materials are used in the manufacture of the air handler casing. The preference for the use of corrosion resistant alloys such as stainless steel is underpinned in the document.

Along the selection of appropriate materials for the casing of the air handler, the prevention of unwanted condensation and standing water in the surfaces of the unit is of the utmost importance in averting the above-mentioned issues as well as the risk of legionella. Emphasis on the use of suitable protection from rain ingress, appropriate draining, the avoidance of evaporative cooling solutions and setting minimum requirements to eliminate thermal bridges in the casework have also been addressed.

Finally, the classification of the air handler casing to established standards is also recommended, with the products now preferably adhering to a classification of D2, L2, T2, TB2 to BS EN 1886. These are important in ensuring low leakage and infiltration, which can undermine the fresh air delivery, filtration and energy efficiency of the equipment, and the thermal performance of the units which can mainly affect the likeliness of condensation forming on the casing and heat loss or gain through their fabric. Leakage and mechanical strength of the equipment in particular must be proven both through factory and in situ testing.

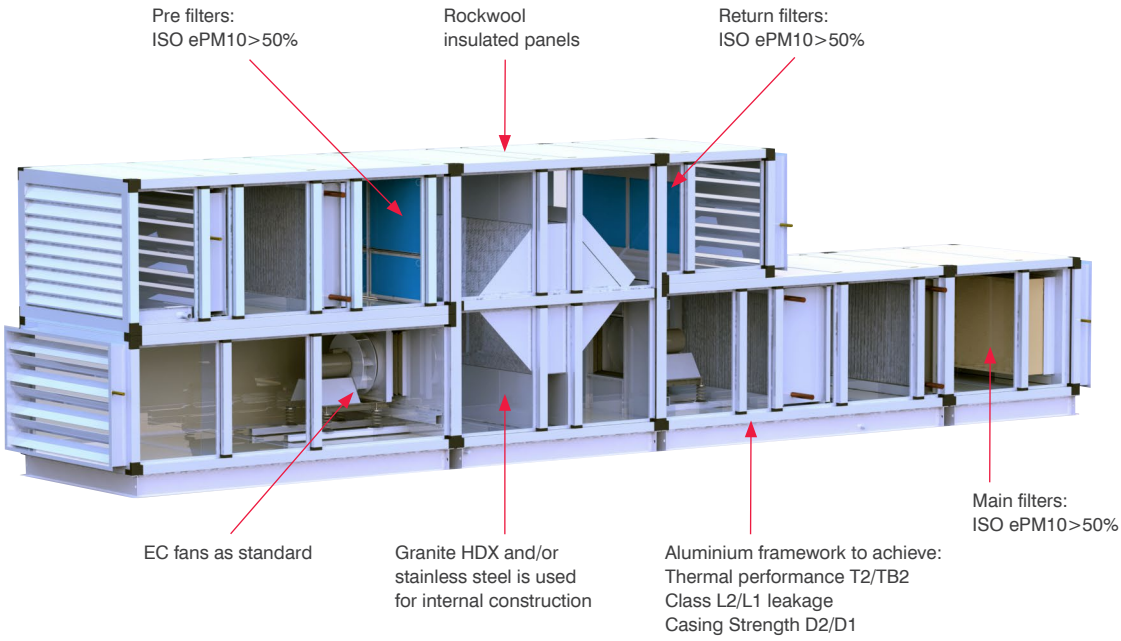


Image shows a diagram of an AHU, labelling some of the basic features that would lead to it being HTM 03-01 compliant

Service, maintenance and refurbishment

Perhaps one of the most important changes to come about with HTM 03-01 (2021) is the increased focus on installation, commissioning, validation and maintenance standards, with the recommendations and guidelines being fully revised to ensure the equipment is not only compliant at the point of installation, but also throughout its life cycle.

Most of the design blunders with air handling units are not evident at the point they are installed, but quickly become apparent when, for example, maintenance cannot be carried out properly due to poor access facilities or cleaning becomes impossible due to a cluttered design inside the unit. Emphasis has been put on providing appropriate access for cleaning and maintenance facilities for servicing the units.

Validation acceptance standards and methodology, guidelines on the commissioning process, routine inspection and maintenance have also been completely revised. Furthermore, guidance is also given on the expected lifecycle of the units - 20 years - and the updating of mid-life plant which should be taken out of service, deep cleaned, their controls renewed and recommissioned after 10 years.

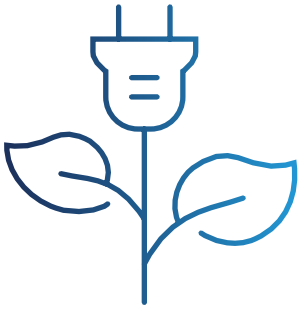
Resiliency

As established already, resiliency of the ventilation system is crucial to safeguard the operation and capacity of the healthcare building and the health and lives of those working and being treated within. Long system shutdowns are not acceptable. It is only natural then that the new guidance emphasises the need to quickly and effectively maintain and service the plant, especially in those areas where failure of the equipment can have irreversible consequences – the so-called critical areas.

To this end, fan walls are suggested to provide resiliency and increased capacity of the systems, which in the event of a fan failure should still be able provide at least 80% of the design capacity. Fan walls also provide advantages in facilitating the quick replacement of faulty fans as they are composed of several small fan assemblies rather than a single large one. The revision also requires that fans in critical areas can now be replaced in 20 minutes or less, with the use of quick release plug and socket connectors to facilitate this. It should be noted however that in non-critical areas a single fan might still be the preferred option, as multiple fans come with the disadvantage of increased capital cost and inefficiencies associated with the use of multiple motors and impellers.

Efficiency and sustainability

In line with the demand for more energy efficient solutions, another key revision covers new technologies in air movement, heat recovery and controls.



Fan technology has come a long way since 2007, with Electronically Commutated (EC) fans now being widely used for their energy efficient motors, ease of control, flexibility, and compact size. Heat recovery devices are now capable of achieving significantly higher efficiencies, yielding major energy savings when properly applied and BMS systems are commonplace in most buildings. The new guidance steers designers towards these new technologies and highlights their importance in achieving an efficient and sustainable design.

Furthermore, energy intensive requirements such as the need for HEPA filters in critical areas, droplet eliminators to prevent water carryover and protective mesh guards on fan inlets have been reconsidered to being included only where strictly necessary. This change can have a huge impact on the lifecycle energy consumption and the efficiency of the equipment and it's remarkable that we are finally seeing their inclusion being re-considered.

Interpreting the revisions

As with all new legislative or guidance instruments, understanding the content is key to effective implementation and this can often be inconvenient, time-consuming, and costly, especially if these are published halfway through the construction or design of a building, as has no doubt happened to many projects when the HTM 03-01 revisions were published.

These difficulties can arise because whilst the guidelines are thorough and all-encompassing, they cannot be absolute or too prescriptive, as they need to be interpreted in the context and demands of the project they are to be applied to. It is crucial that when recognising the revisions and making appropriate changes to current working practices, those responsible for adjusting the specifications have the experience and critical thinking skills to implement the changes appropriately and purposefully. This is where the engineering expertise of manufactures can become important.

The revisions made to the document are mostly appropriate to deliver improved IAQ, resiliency and energy efficiency to the healthcare setting, but perhaps not every change should be taken to the letter. The HTM is after all open to derogations from the guidance as long as these provide an equivalent degree of safety. There are value engineering options available that would deliver identical value and results without inflating the cost to the design. Take the new recommendation for the casing construction to be thermal transmittance T2 and thermal bridging TB2 for example.

T2/TB2

Requirements for a T2/TB2 casing construction are now an integral part of the HTM 03-01, with the aim of combating condensation and heat loss through the casing of the air handler. Taken at face value, it would be fair to assume all healthcare AHUs now need to be classified as T2/TB2, under the BS EN 1887 standard.

However, casings designed to achieve a T2/TB2 classification are expensive and often make use of plastics to provide thermal breaks between the inside and the outside of the casing. Furthermore, their use is not always warranted unless certain risk factors are present. They are therefore not always the most cost effective, environmentally friendly, or appropriate solution. As a supplier of bespoke air handling products, T2/TB2 casings included, we could gloss over this, but we know this solution is not appropriate for all situations and can often add a lot of cost to the project while providing little added value.

T2/TB2 is essential in areas that might be subject to high relative humidity and extreme temperatures, where the temperature differential between the outside and the inside of the unit is sufficient to create concerns over the formation of condensation on the surface of the casing.

However most healthcare AHUs will be housed in a ventilated plant room in sheltered conditions, where the ambient temperature is controlled… and with these units often not cooling to very low temperatures ($<10^{o}C$). That said, if compliance is essential, then T2/TB2 construction must be adhered to.

This is just one example of why interpretation and knowledge are key. It is obvious to us that some revisions need to be applied across the board, whereas others need careful interpretation. Some affect installation, others impact the lifespan of the unit. They are all important to improving IAQ, reducing waste, helping the NHS achieve their efficiency goals and meeting required standards, but all need applying to different degrees depending on the environmental setting.

Allowable derogations from HTM 03-01

HTM 03-01 is not a legal document, and it is therefore acceptable to move away from the specification, but only providing the alternative suggestion does not in any way compromise performance and validity of the unit. It is noted in the preface of HTM 03-01 Part A that:

This guidance is not mandatory (unless specifically stated). However, any departures/ derogations from this HTM – including the measures implemented – should provide a degree of safety not less than that achieved by following the guidance set out in this HTM.

This note shows that derogations are possible and will allow us to make any such changes providing we advise our client of the below points:

> ***4.10 Any derogations or alternative design strategies from this guidance should be subject to the scrutiny and agreement in writing by the VSG. The reason for the derogation or alternative design strategy and limits to its application should be recorded.***
>
> ***4.11 Designers proposing a derogation or alternative design strategy should be able to supply a body of evidence that their proposal will provide a degree of safety no less than if the guidance in this document had been followed.***

The above is fair. A lot of research and work has gone into delivering the HTM and everything within it has meaning. Moving away from it therefore needs to be justified.

Undisclosed non-compliance to HTM 03-01

Sadly, as time has passed since the introduction of the update, we as experienced manufacturers, are coming across specifications, quotes and documentation that suggest that some end users are unknowingly being sold units that claim to be HTM 03-01 compliant, but in reality, aren't. Corners are being cut, presumably to save on cost, and the 'expert' selling them is passing them off as vaguely compliant.

The risk to clients

The issue we have seen is that many of our clients, or prospective clients, have been told it isn't a legislative document and they can save money by moving away from it – but they haven't had the documentation to suggest that the value-engineered alternative is still compliant.

The result being that well-meaning facilities management people, consultants and facility providers might believe they are engaging with a well-informed supplier and purchasing HTM 03-01 compliant equipment, but for the sake of some up-front budgetary savings, are significantly compromising on the validity of their plant and more importantly, the quality of their indoor air.

To be clear, we are not saying everyone is doing this, and we are not even saying this moving away from the regulations is being deliberately deceitful. What we are saying is that we have seen it happen, and we have seen clients not realise they are non-compliant, or not know what to look for when it comes to being compliant or varying from the HTM, so here we have offered an analysis of what constitutes compliant, where the shortcuts more often occur and what to look out for.

With this knowledge, clients can then make a more informed decision about:

- What air quality is right for their facility
- What areas they are willing to compromise on
- Is their facility HTM 03-01 compliant or not

The bottom line

The harsh reality of the HTM 03-01 (2021) update is that to be fully compliant, it will eat into more of the budget due to high quality materials, time consuming processes and on-going maintenance costs. That said, knowing the improvements and benefits to be gained from improved air quality, it does very much come down to you get what you pay for, and when it impacts healthcare, it is hard to find a compromise.

Compliance and Derogations

If you are specifying HTM 03-01 (2021) compliant, our first recommendation is to request documentation to demonstrate conformity to the points listed below.

HTM 03-01 Part A Table 8 – Plant minimum standard

The table below is taken from HTM 03-01 Part A. These are the minimum standards that plant needs to adhere to be considered suitable for use within a healthcare environment. Below the table we consider some of these points and how to be compliant, possible derogations, what shortcuts we have seen and why we see them.

Heading	Specification	Comments
Construction	Double metal or composite skin with sandwiched insulation to "Euroclass A" fire rating Smooth internal surface without channels or ridges No projecting spire or tech screws inside the unit.	Note: Capping projecting spire screws is not acceptable
Internal Surface Finish	Non-corrodible, washable and smooth and of a colour that allows accumulations of dirt to be easily seen	Stainless steel or white powder coated mild steel or with an equivalent protective treatment; but NOT surface galvanised
Thermal Transmittance	BS EN 1886 Class T2	Manufacturer's declaration
Thermal Bridge	BS EN 1886 Class TB2	Manufacturer's declaration
Deflection	BS EN 1886 Class D2	Manufacturer's factory test
Factory airtightness – pre-delivery	BS EN 1886 Class L2	Test at +700Pa and -400Pa
Site airtightness test	BS EN 1886 Class L2	+700Pa/-400Pa
Filter frame bypass leakage	BS EN 1886 Section 7	
Supply and extract intake and discharge isolation dampers	BS EN 1751 C3 (low loss)	Motorised opening and fitted with an end switch and spring return
Access doors	Secured from casual access. Fan chamber doors to be fitted with a two-stage latch	Key or similar device required to open access doors. Door hinges should be adjustable so that leakage can be eliminated on site
Specific fan power – internal (SFPint)	Current Eco design requirement for energy-related products (ErP)	EU 1253 – 2014
Specific fan power – system (SFPsyst)	UK Building Regs	Part L2
Energy recovery	Current ErP EU1253	Run-around coil – 68% Heat pipes – 73% Plate heat exchanger – 73% Thermal wheel – 73% Heat pump – EU 2281/201 Any other device – see standard

Construction – fire rating

Construction of an AHU can really vary, and make a significant difference to performance, efficiency and safety. A key factor of this the fire rating of the materials used and what standard they adhere to.

HTM 03-01 states that all panels should be insulated to Euroclass A fire rating. The Euroclass system determines a product's fire performance by measuring a comprehensive set of characteristics, including ignitability, flame spread, heat release, smoke production and propensity for producing flaming droplets/ particles. The classifications run from A1 to F and are defined with examples in the table below.

Rockwool or mineral wool is one of the only materials that conform to a Euroclass A rating as it is a non-combustible product. Any other insulating materials are classed as combustible and must not be used. This is due to historic instances of lower quality insulation materials being used in building services such as the tragic Grenfell tower disaster.

Rockwool insulation is standard across our range. By providing this type of insulation we are providing the best option currently available to ensure conformity with HTM 03-01 (2021).

Fire rating derogation

It has been observed that some other manufacturers do not conform to this regulation. We have examples of companies who detail their panel insulation on hospital AHUs as 'Injected Polyurethane' or "Polyurethane Foam."

Expanding polyurethane foam, once injected into the panels and hardened, can provide a strong material which will contribute to the structural strength of the AHU. Compared to other construction methods, it can substantially reduce the time and cost of production because it allows for enclosure panels to be manufactured at a very large size, while preventing deformity, and therefore leakage and structural issues, of the panels. With a "good enough" performance and reduced production time and costs, some manufacturers have used polyurethane in their construction, but because it is combustible, it isn't suitable for HTM 03-01 applications. It is important that customers realise that any AHUs implementing this construction technique should not be passed off as compliant.

HTM 03-01 fire rating compliance promise

As an example, to meet the strict HTM 03-01 (2021) fire rating guidelines, at Airedale we insulate our Barkell AHU enclosure panels with rockwool, minimising the panel size, to maximise structural strength and prevent leakage via panel deformation. Additional structural support is given through the use of AHU post work. This additional post work can be expensive on larger AHUs, and requires more time to fit and manufacture over large rigid panels.

Due to the nature of rockwool panels, the inner and outer skin of the panels have to be fitted together, increasing the overall time of manufacture which will understandably impact on cost.

As with anything that impacts health and safety, it is imperative to use the correct materials and not cut corners. The impact of that is often cost, but when explained to customers most accept that the investment is necessary, in order to deliver the 'Euroclass A' rating required in HTM 03-01.

Euroclass fire rating system:

Euroclass	Definition	Example Materials
A1, A2-s1, d0	Non-combustible	Stone wool, glass wool, concrete, bricks
B	Combustible	Some phenolic foams
C	Combustible	Phenolic, some PIR
D	Combustible	PIR
E	Combustible	Flame retarded EPS/XPS, PUR
F	Combustible	PUR

AHU thermal performance

As per above table 8, the thermal transmittance and thermal bridging of the AHU needs to comply to BS EN 1886 Class T2 & BS EN 1886 Class TB2 respectively to be considered HTM 03-01 compliant.

Thermal performance guidelines derogation

We aware that some manufacturers detail thermal transmittance in their healthcare AHUs as complying to T3 TB3 standard. These manufacturers are not doing anything deceitful in sharing their full specification, but it is important that clients recognise that T3 TB3 on your specification will mean the AHU doesn't comply to HTM 03-01.

There will be instances where T2 TB2 perhaps is not required for performance, but it is required for compliance and therefore whilst a manufacturer might recognise that, if they claim it also meets the HTM 03-01 (2021) guidelines, this would be incorrect.

Also, and this of significant concern, we have also seen quotes for AHUs that are claimed to adhere to HTM 03-01 and within that, comply to T2 TB2, that sadly don't. This wouldn't necessarily be obvious to someone outside of the industry and of course if a specification claims to be compliant, most would take that on face value.

However, we have looked at their construction technique in detail. This particular unnamed example uses a technique we have worked with on other projects and as such have good reason to believe that it would be near on impossible to achieve a mechanical performance of T2 TB2 using this method of manufacture. We currently hold data on file showing that T2/TB2 is not possible using this method of framework. This is further illustrated by the diagram below, providing a direct thermal link between the inside and outside air.

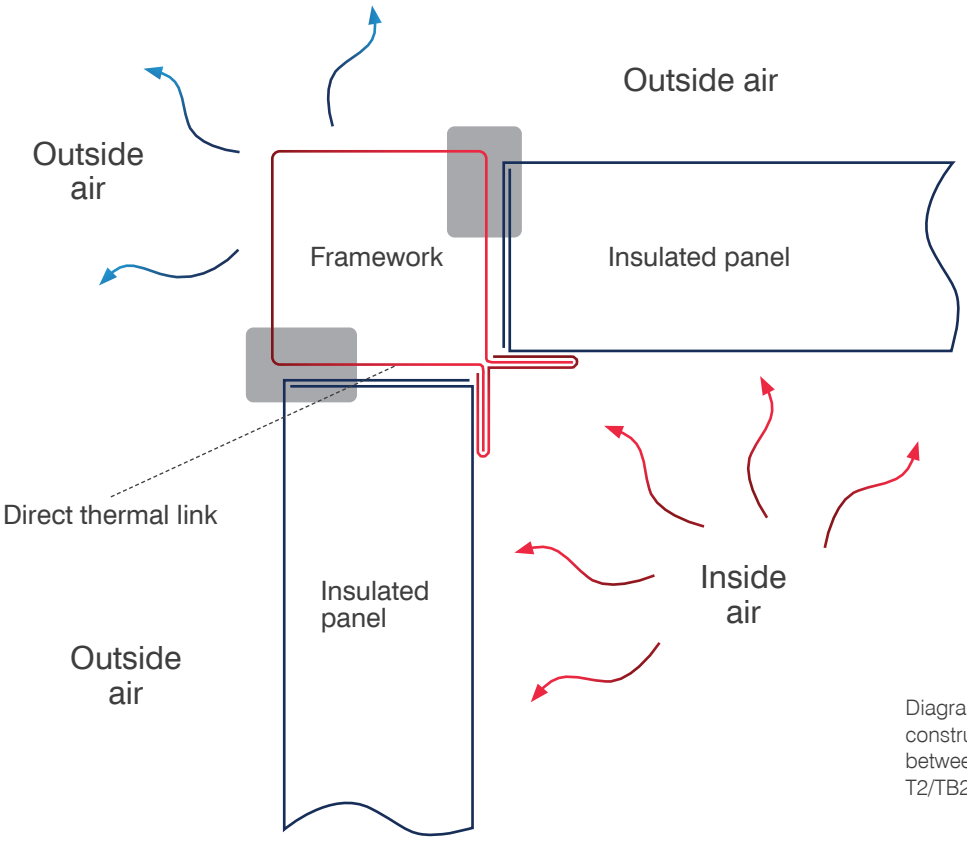


Diagram shows how this method of construction would deliver a direct thermal link between the inside and outside air, making T2/TB2 classification almost impossible

We can only assume that the reason lower classifications of thermal bridging are being employed is due to the impact on cost. Sometimes clients do push for price reductions and it is these areas that savings can be made without impacting on profitability, but it will impact on the unit's ability to adhere to HTM 03-01, so this needs to be made clear to the client.

HTM 03-01 compliance promise – thermal performance

As a means of assurance, we work with a solution that has been tested by both ourselves and esteemed third party to ensure there is no doubt around compliance. We can and do offer price competitive value engineered solutions to clients who want it, where compromise might be made on areas such as thermal bridging, but there has to be transparency around this, because in this instance, a value-engineered solution would not meet HTM 03-01 legislative guidelines and therefore would not be suitable for many of our NHS and other healthcare clients.

Fans

Another area where costs can be cut, but inefficiencies subsequently incurred, is the use of AC direct drive fans which require inverter drive.

HTM 03-01 Part A clause 9.40 specifies fans should be EC direct drive type fans, Again these have a higher upfront cost, but offer considerable savings over the lifespan of the AHU due to reduced energy consumption and so for the end user, are more cost efficient long term.

Away from the cost side, a significant consideration of the NHS at the moment is sustainability. Energy efficiency is a huge part of this and as such EC fans are preferable to meet both HTM 03-01 guidelines, and to be part of a more sustainable solution.

Fan derogations

Alternative fan types, such as AC and PM fans, can sometimes be energy efficient, but this very much depends on the project specification. Belt and pulley driven fans are not HTM 03-01 compliant due to low efficiency. These alternative fan types may reduce the upfront cost of a unit, but may also render it non-compliant to HTM 03-01 (2021) and therefore it is important to understand the context of the project before making a decision on fan type, recognising that price isn't usually the most informed way of finalising a specification. When price is being used as the driver for decision making, we often see that true life-cycle costs are not being considered, because a more energy efficient solution with harder-wearing components will over time prove to be more economical.

Other specifications

The opportunities for examples of non-compliance are endless. We have seen many alternative specifications presented as being HTM 03-01 (2021) compliant solutions, which in reality, are not. The recurring theme is however obvious at this point:

- Cost savings are being made, probably due to pressure on budgets
- The cost saving alternative does not have the supporting paperwork required to verify it still meets HTM 03-01…
- … thus the AHU is no longer HTM 03-01 compliant
- This non-compliance is not being made clear, or is explained away as the HTM not being legislative
- The AHU installed is now not meeting specification, but this gets lost in the process that started with a HTM 03-01 specification, and ended with a value-engineered solution

The real cost of HTM 03-01 derogations

Derogations from HTM 03-01 are it seems a cost saving method employed by some AHU manufacturers. If this is done so transparently, then one could argue that no harm is being done, but that is only if the client is fully aware of the implications of not being HTM 03-01 compliant.

At operational level, there are considerable running expenses to be incurred by using less efficient materials and components, so the costs savings gained at capital cost are very much out-weighed by the operational costs. This includes, but is not limited to factors such as:

- increased running costs due to higher energy use
- the potential for increased maintenance costs due to reduced quality materials
- increased fire risk that would lead to replacement materials being required

As mentioned in our introduction, the reason behind HTM 03-01 (2021) is not cost, but is for health and wellbeing of service users, along with the NHS keen focus on becoming more sustainable.

Therefore there are other issues associated with not being compliant, including, but again not limited to the following:

- reduced indoor air quality as a result of poor filtration
- increased fire risk with the potential to harm employees and service users
- high energy consumption due to inefficient components/ technology
- loss of contract due to not being HTM 03-01 (2021) compliant

Is there a place for value engineered alternatives?

Most manufacturers will have experienced some pressure from clients who are under budgetary restrictions, and will understandably offer value-engineered solutions to try meet their needs. It is imperative that they are transparent about what these alternatives mean for compliance, and advise clients as to whether or not the unit will still meet HTM 03-01 (2021) guidelines:

- Manufacturers must be clear about the solutions they deliver and what they can and cannot do.
- For example, a T3/ TB3 construction might be suffice for the project and they tell you this, but must also explain it doesn't meet HTM 03-01 (2021).
- Manufacturers should not offer sub-standard construction simply to save on cost, because it will end up costing the end user, either financially or morally, in the longer term.

Due diligence

As part of our due diligence at Airedale, we contacted the author of HTM 03-01 (2021) to consider the cost implications and what impact deviating from the regulations might have. It was advised which clauses of HTM we must not deviate from and we adhere to this, hence why our conformity to HTM might seem so strict when compared to our competitors.

Of the derogations that are acceptable, we will detail what it would entail, the cost saving and add any additional information we think our clients need to know. We also ask our clients sign to state their understanding and acceptance of any derogations.

Supporting our NHS and other healthcare facilities

As a trusted and experienced bespoke air handling unit manufacturer, that has a long history of working with the NHS and supplying HTM 03-01 compliant AHUs, we will always work to meet our client's requests, ensuring they receive the best advice available without compromising on safety, wellbeing and legislation.

Our experience of working with HTMs allows us to understand, interpret and apply the guidelines, ensuring the wellbeing of the end user is not compromised. With this knowledge comes a responsibility, and because healthcare is such an important industry, we want to share our knowledge of the guidelines so those with perhaps less experience of it can look out for specifications that may have deviated from the guidelines, or perhaps don't have the correct paperwork to support the derogation.

Having such detailed knowledge of HTM 03-01 means we can recognise when it isn't being correctly implemented and what impact this might have. If cost is a driver we can work with you to find VE solutions, but If HTM 03-01 is the goal then education is important to understand the upfront costs, the life cycle pay back, and the implications of being non-compliant.

Summary

To summarise, the changes to air handling unit design introduced with the publication of the revised HTM 03-01 (2021) mostly address topics which have long been in the agenda, such as new legislation and standards, system resiliency, efficiency, sustainability, and the improvement of IAQ. In brief, that the following major areas have been addressed in this revision:

- Refresh of existing standards and legislation including the eco-design directive for ventilation products (EU 1253/2014) and updated filtration standards ISO 16890.
- Selection of appropriate manufacturing materials with focus on avoiding corrosion, growth of microorganisms and unwanted condensation.
- Implementation of energy efficient solutions for air movement, heat recovery and controls, covering newer technologies such EC fan walls and the overhaul of outdated inefficient requirements such as the use of droplet eliminators and fan mesh guards.
- New requirements and recommendations to improve system resiliency such as the use of fan walls and appropriate access and maintenance facilities.
- Updated installation, validation, commissioning, maintenance, and service requirements and guidance.

Derogations

Informed interpretation of these changes will make all the difference to not only meeting the required standard for healthcare ventilation systems, but also meeting budget requirements by supplying systems that are cost effective and appropriate for their environment.

However it is important that customers are aware of the risks to the healthcare facility and to their relationships with healthcare clients of not being compliant – a reduction a cost is not worth the reduction in standards and damage to reputation where healthcare is concerned.

It is therefore critical that clients remain vigilant to manufacturers who may, either deliberately or accidentally, claim something to be HTM 03-01 compliant when it isn't.

As experts in the application of HTM 03-01, Airedale recommends engaging with experienced healthcare ventilation suppliers for more detailed information on how specific products can comply with the HTM 03-01 (2021).

HTM 03-01 CPD

Anyone who is familiar with the HTMs will know that while some of the guidelines are straightforward and easy to understand, most of the guidance can be vague and somewhat open to interpretation. The new version of the HTM 03-01 still contains many potential grey areas and its execution should therefore be discussed carefully and objectively. For this reason we have released a free-of-charge CPD on the topic which will hopefully allow us to both inform and open a dialogue with professionals in our industry.

CPD

Proud to be a member of Made in Britain, Airedale is a world leader in the delivery of innovative thermal management solutions to the healthcare industry. With extensive experience of working with the NHS, they are experts in the application of Health Technical Memorandum 03-01 (2021) and work closely with clients to deliver HTM 03-01 compliant cooling solutions, meeting specific temperature and air filtration requirements.

Since 2021, Airedale has presented their CIBSE approved HTM 03-01 CPD to over 750 professionals, covering the updates and application of HTM 03-01 (2021) in more detail. More information is available at **www.airedale.com.**

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