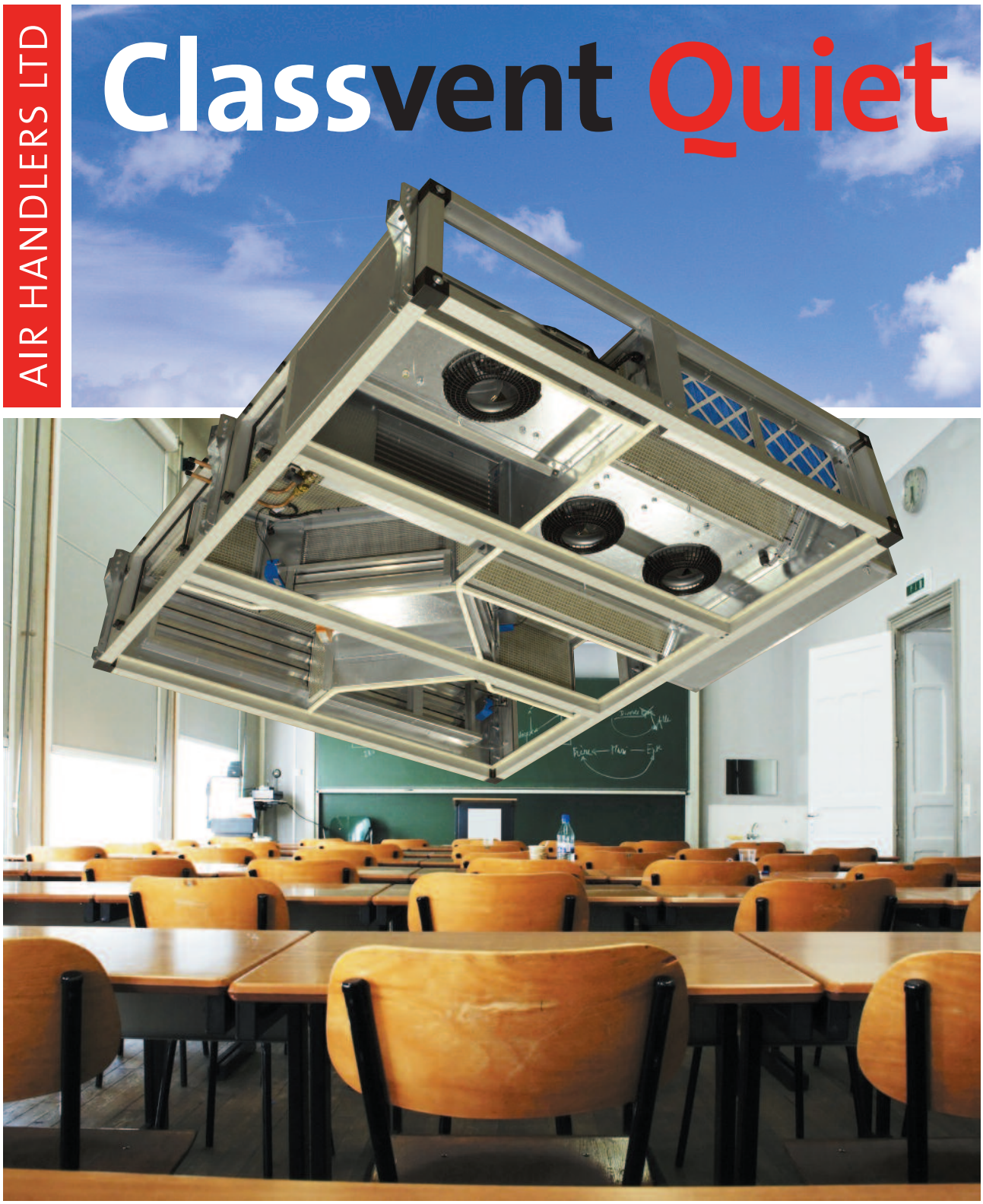
AIR HANDLERS LTD

Classvent Quiet



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College of Science & Technology

Engineering Solutions

air HANDLERS

Quiet Classroom Ventilation with CO_2 Control

About Air Handlers...

Established in 1989 and located in Salford, the company manufactures air handling units for municipal, commercial, health care and industrial use. Our 50,000 square foot purpose built factory is considered one of the most modern air handling manufacturing facilities in the United Kingdom.

The first Classvent was commissioned and installed in 2007 and the demand for it has grown from year to year. The wealth of knowledge gained by consistent improvement and research has led to the introduction of the Classvent Quiet low noise breakout ceiling mounted heat recovery unit with independantly acoustic tested casework specifically designed for schools, colleges and universities.

Air Handlers are pro-active in understanding the changes to building services low energy specifications and this has led to the development of the Classvent range, specifically designed for classrooms and places of learning. This product was the first ceiling mounted heat recovery unit to incorporate summer boost ventilation, recirculation dampers for start up, fully automated control and connection to BMS control.

Our team of research professionals are committed to developing products with sustainable energy solutions to meet today's demands for reducing ventilation energy consumption.

Accreditation...

Building Bulletin 101 and 93 (Feb 2015) compliant.

CIBSE TM52 The Limits of Thermal Comfort: Avoiding Overheating in European Buildings compliant.

The first heat recovery unit to incorporate summer boost ventilation, recirculation dampers for start-up, fully automated control and connection to BMS control.

The first classroom HRU to have independently acoustically tested casework for frame and panels

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Location...

Classvent Quiet Package Heat Reclaim Air Handling Units are normally located within the ceiling void of classrooms and teaching spaces. Reverberation control is required in the room to achieve the requirements of Building Bulletin 93, February 2015 Acoustic Design of Schools: Performance Standards

Construction...

Frame

Insulated extruded anodised aluminium pentapost sections with solid die cast mechanical fit corners are used to build each frame. The frame is acoustically insulated to prevent noise leakage.

Panels

Panels are flush fitted into the frame and air sealed with neoprene gaskets. A range of acoustically insulated panels are available to meet the sound reduction required in the classroom space.

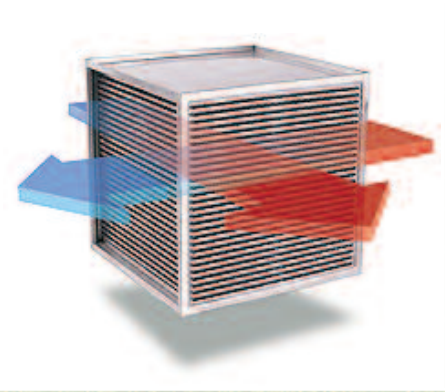
To achieve the sound reduction requirement, panels will be 50mm double skin construction with an inner and outer skin of 1.2mm galvanised sheet steel, insulation will be an acoustic/thermal composite containing a polymer barrier insulation with triple skins.

Access Panels

All access panels will be flush mounted in the frame, and constructed as the fixed panels. Fan and control panel access panels will be lockable. Quick release fasteners will be used on other access panels.

Heat Recovery

Classvent Units utilise a diagonal cross flow plate heat exchanger having sealed shaped plates, giving energy recovery efficiencies of 50<70%.



A drain tray is provided with an in built condensate pump operated via a float switch. Face and bypass dampers, actuator operated, offer a summer by pass facility.

Filters

Filtration is fitted to both the fresh air inlet and the return air inlet. Filters are disposable vee type panel filters with a Eurovent G4 Grade arrestance.

The fresh air inlet filter protects both the Classvent components such as coils, plate exchanger etc., along with particles entering the Classvent fresh air intake.

The main function of the return air filter is to prevent particle build up in the recuperator.

Vee type panel filters have a clean to dirty differential pressure drop of 35<85 pa. Each filter bank is fitted with a differential pressure switch to indicate dirty filter conditions via the control system.

Heating Coil

A heating coil is fitted to raise the leaving air temperature. The coil is a low pressure hot water type, constructed from copper tubes and headers with aluminium fins.

Coil connections are contained inside the Classvent Unit and factory piped to a manual balancing terminal multi-port valve unit, comprising flushing by-pass valve, fixed orifice commissioning valve, and drain cock. Flexible hose connections are provided and terminate on the exterior of the casework.

Coil Options

Electric heater batteries are available as an option to LPHW. They utilise a Thyristor controller giving variable temperature control from the control system.

Cooling Coil Options

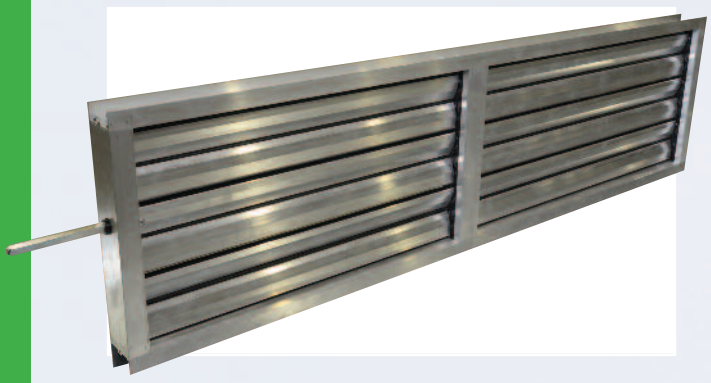
Cooling coil options are available to offer mechanical cooling, direct expansion or chilled water coils constructed from copper tubes and headers with aluminium fins can be integrated into the Classvent and its control system to offer mechanical cooling with TM52 limits of thermal comfort: avoiding overheating to European Buildings Compliance.

Drain trays are fitted to cooling coils with a option of natural drain connection requiring an external trapping arrangement or a condensate pump system

Dampers

All dampers are constructed from an aerofoil section double skin aluminium blade profile with edge, blade and side seals to offer low leakage.

The blade rotation is performed by rigid nylon cogs which operate out of Air Stream. The damper operating mechanism is connected to a factory fitted and pre-wired actuator via a square brass drive shaft.



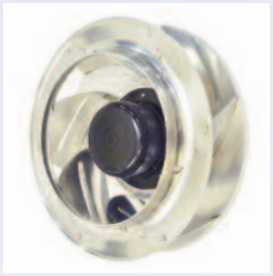
Fans

Classvent Units have supply and return air backward curved centrifugal plug type fans, direct driven by high efficiency EC motors.

This method of scroll free fan produces an optimal low loss flow of air through the impeller so there are no longer any drastic cross sectional changes.

Motors operate via a 0-10V DC output from the motor, it provides infinitely variable speed control.

Backward curved scroll free fans are quiet running with optimised airflow through the impeller, giving significantly reduced tonal noise.



Fan Inlet Flow grids...

By fitting an inlet flow grid to the supply and extract fans, it is possible to achieve significant noise reduction from the fan.

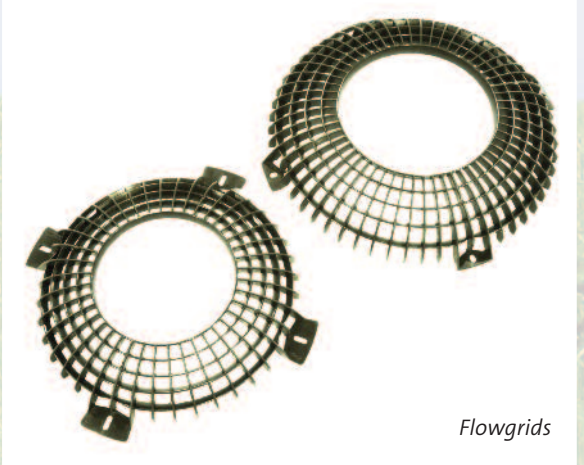
The noise reduction is predominantly low frequency decay (ie 63Hz, 125Hz, 250Hz), which can help offer significant sound power loss. This sound power loss is created by the reduction in turbulence hitting the rotating blades, with tonal frequency components, known as impellor noise or tonal noise.

Tonal noise consists of the blade-passing noise and its harmonics. The frequency of the blade-passing noise can be calculated as the sum of the fan speed and the number of blades.

A flow-grid fitted to the inlet of the fans will significantly reduce the low frequency noise generated disturbance. The vortex is split when impacting the grille as it is considerably weakened when it flows through the flowgrid.

Sound pressure is reduced, particularly the low frequency. The chart below indicates the power loss on octave bands.

Freg Hz	63	125	250	500	1K
Power loss db	-6	-10	-7.5	-8	-1



Flowgrids

Boost Condition...

To comply with the CO_2 boost evacuation in Building Bulletin 101 and Building Bulletin 93 (Feb 2015), the Classvent unit has the facility within the control system and fan selection to boost the extract rate significantly in order to reduce the CO_2 level while the normal supply and extract room volume ventilation rate still functions.

With the increase in extract Air Volume to provide increased CO_2 evacuation, the normal practice is an increase in fan speed to achieve the increase in airflow.

This increase in airflow while it only applies to the time to reduce the CO_2 levels back down to the specified limit, will deliver a considerable noise increase, significantly above the Building Bulletin 93 (Feb 2015) requirement.

The increase in noise level will be produced by the increase in blade passing frequency. To offset this, the Classvent Quiet incorporates two fans working in parallel on the extract side, hence each fan will operate at a considerably lower peripheral speed than the single fan option producing a much reduced noise level in compliance with Building Bulletin 93 (Feb 2015).

Consideration is given by fact that two fans producing equal noise levels will produce a higher collective noise level of approx. 3db, but this noise increase is much less than the generated noise of the supply fan.

Acoustic Absorber Panels...

To reduce the sound pressure level inside the Classvent Unit, absorber panels are used which will reduce up to 6dbA sound pressure inside the casing.

This noise absorption not only reduces noise breakout but reduces duct borne noise as well. Absorber panels are constructed with a tuned perforated metal face with acoustic absorbent material melinex wrapped.

Attenuation...

All attenuators provided to match the Classvent Unit are supplied as an integral or bolt on arrangement. This is recommended to prevent noise flanking the attenuators.

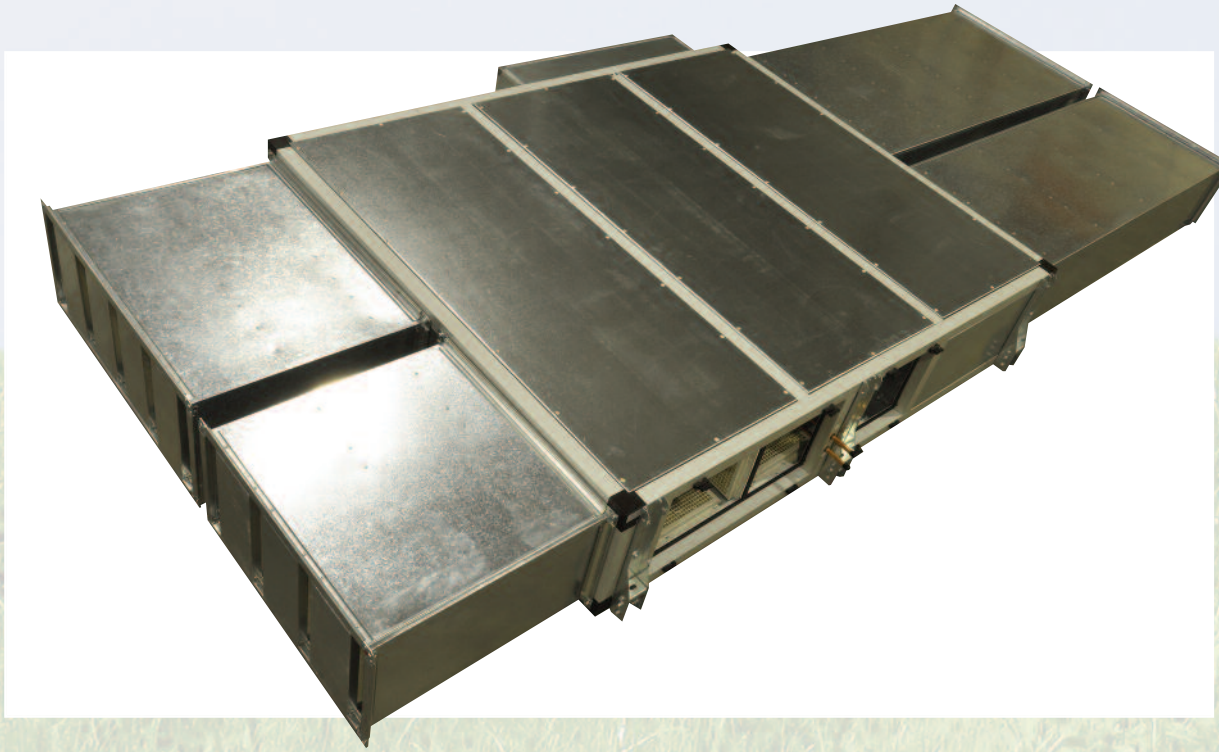
If attenuators are positioned away from the noise source (ie Classvent Unit) then duct noise breakout will occur, unless the duct is acoustically lagged to the same high standard.

Option 1

Splitter absorbers inbuilt into the Classvent Casework which provides a uniform casework appearance, particularly for Classvent Units on view in the room with no ceiling.

Option 2

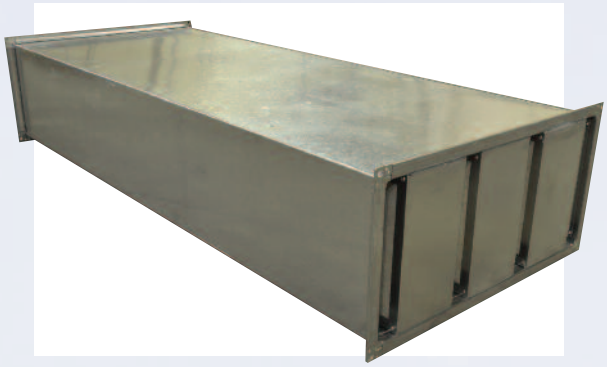
Duct style attenuators with bolt on arrangement as shown below. The splitter absorbers are contained within a galvinised sheet steel duct.



Attenuator Performance...

Insertion losses for different attenuator lengths serving atmospheric and system side.

FREQ HZ	63	125	250	500	1K	2K	4K	8K
600mm long	-6	-11	-20	-30	-38	-38	-38	-30
900mm long	-8	-16	-26	-42	-48	-48	-48	-42
1200mm long	-10	-20	-33	-48	-51	-51	-51	-46
1500mm long	-13	-25	-40	-53	-55	-55	-55	-50
1800mm long	-15	-30	-50	-55	-55	-55	-55	-54



Performance Range...

MODEL	NORMAL AIRFLOW (M3/SEC)	ESP(PA) MAX	BOOST AIRFLOW (M3/SEC)		MAX MOTOR POWER	MAX FAN SPEED	MAX CURRENT AMPS
CVQ1/1400/220	0.05<0.1	200	0.16	Normal	137W	3800RPM	0.9
				Boost	274W	3800RPM	1.8
CVQ2/1850/390	0.1<0.3	250	0.60	Normal	390W	2300RPM	2.6
				Boost	780W	2300RPM	5.2
CVQ3/1850/680	0.3<0.6	300	0.90	Normal	680W	3000RPM	4.3
				Boost	1360W	3000RPM	8.6

Dimensions & Weights...

MODEL	WIDTH	HEIGHT	LENGTH	CASEWORK CONSTRUCTION						
				PB25	AS25	PBFG50	PB50	PBTS FG50	ASTS SPB50	ASQS PB50
CVQ1/1400/220	1400	450	1420	220KG	246KG	285KG	305KG	302KG	348KG	389KG
CVQ2/1850/390	1850	450	2200	372KG	428KG	498KG	518KG	506KG	597KG	636KG
CVQ3/1950/680	1850	500	2200	381KG	434KG	509KG	530KG	520KG	616KG	651KG

Note: The Classvent dimensions and weights are for the Classvent Unit only, inlet and outlet attenuators will be additional length and weight.

Attenuators...

LENGTH	CVQI/1400/220 WEIGHTS (KG)	CVQ2/1850/390 WEIGHTS (KG)	CVQ3/1950/680 WEIGHTS (KG)
600mm	102	167	203
900mm	153	250	301
1200mm	204	331	402
1500mm	344	410	503
1800mm	204	499	604

Acoustic Performance...

To meet varying room acoustic performance requirements the Classvent has several casework options. In all cases the pentapost frame is acoustically insulated, and the panels are 1.2mm thickness sheet steel with different acoustic insulation options.

Panel Options can be double/triple/quadruple skin to maximise acoustic breakout performance.

FREQ HZ	63	125	250	500	1K	2K	4K	8K
SINGLE SKIN								
PB25	20.4	23	22.9	23.3	33.6	37	37.7	45.5
AS25	19.9	23.5	29.4	36	39.1	34.1	34.5	40.8
PBFG50	19.6	18.3	33.3	39.8	36.6	36.1	39.3	46.8
PB50	21.8	23.8	22.1	26	35.6	35.2	32	40.1
TRIPLE SKIN								
PB/TS/FG50	21.1	21	36.3	39.2	41.7	34.7	32.9	40.2
AS/TS/SBP50	24.1	27.1	34.8	37	37.2	33.5	36.2	39.6
QUADRUPLE SKIN								
AS/QS/PB50	24.1	36.6	34.7	39.8	40.7	37.8	39.7	43.7

The acoustic performance for these above panel and frame assemblies was tested to UKAS standards at Salford University Acoustic Laboratory and fully in accordance with BS EN ISO 10140-2 (2010) Report No's 1429/2060.

Certification 1429 & 2060...


University of Salford MANCHESTER

TEST REPORT No : 1429-A

DATE OF ISSUE : 7 November 2013

BS EN ISO 10140-2 : 2010

INTERNATIONAL STANDARD METHOD FOR MEASUREMENT OF AIRBORNE SOUND INSULATION OF BUILDING ELEMENTS

CLIENT:

University of Salford MANCHESTER

TEST REPORT No : 2060-1

DATE OF ISSUE : 19 February 2015

INTERNATIONAL STANDARD METHOD FOR MEASUREMENT OF AIRBORNE SOUND INSULATION OF BUILDING ELEMENTS

BS EN ISO 10140-2 : 2010

CLIENT:

Classvent Quiet Description of Operation...

Classvent operation based on a typical unit delivering 256 l/s.

The Classvent heater battery is sized to deliver 6KW of heating on a controlled strategy. It is worth noting the heating can be delivered instantly via the Classvent Unit as opposed to a slow reacting radiator. The unit also offers the benefit of never over or under shooting on the required temperature.

Start Up – The unit is set to operate on a time clock or via an enable signal from the BMS to increase the room temperature to 18 deg/c before the room is occupied.

The unit runs in recirculation mode at a setback volume (both fans running at 40% duty).

The fans will use 35W in this mode.

PIR Occupancy – The unit will operate when the room is occupied and will increase the room temperature to the desired temperature.

The unit runs in full fresh air mode and will run for approximately 10 mins. The fans will use between 35W and 150W in this mode (at the discretion of the CO2 Sensor or overridden for heating demand).

Typical Ventilation – Operation in this mode is when all requirements are satisfied and the unit runs on demand control in the dead band of 20 – 26 deg/c. The unit runs in a setback mode. 20% duty. (2 Volts). The fans will use 35W in this mode.

Full Volume Ventilation – Operates when the CO2 level reaches 1000ppm in the space. The unit runs in full fresh air mode until the CO2 level is satisfied. The fans will use 150W in this mode.

Room Minimum Set Back Temperature – In this mode the unit is set to run if the room temperature drops below 10 deg/c, outside of normal working hours.

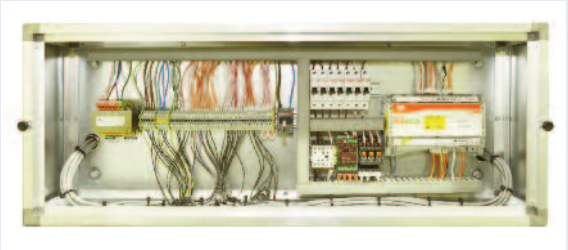
The unit runs in recirculation mode at a setback volume until the temperature reaches 12 deg/c.

The fans will use 35W in this mode with full heating (6KW) and then switches off when temperature is satisfied.

A teacher boost button can be incorporated in the system positioned so the teacher can overide the controls to bring the extract boost volume increase

Control Features...

- ✔ TREND ECO controllers fitted for cost effective installation.
- ✔ Fully integrated with BMS – BMS time scheduling and fault indication.
- ✔ Fresh Air/ Exhaust Air (with heat recovery) or full recirc for optimum energy efficiency.
- ✔ Reduced volume and temperature set point when rooms unoccupied – When enabled but unoccupied units operate (in recirc) at a reduced volume and temperature set point to reduce energy consumption.
- ✔ P.I.R. Sensors – When occupied (the P.I.R. made) units operate in full fresh air exhaust mode at an increased volume and temperature set point.
- ✔ CO_2 Sensing – When the pre-set CO_2 level is reached a boost condition is automatically initiated to reduce the room CO_2 levels to below 1000ppm.



- ✔ CO_2 Boost Manual Override – For independent boost control at the discretion of the teacher. If intermittent boost buttons are used for teacher control then 5db can be added to the indoor ambient noise level (IANL) BB93 (Feb 2015)
- ✔ Quiet Operation – When in boost mode, twin extract fans operate in parallel to give reduced noise within the classroom.
- ✔ Room Minimum Set Back Temperature – If the room temperature reduces below a predetermined set point (out of hours) the unit will operate at a reduced set point.
- ✔ Frost Protection –With a Room or Supply air temperature of below 5°C the unit will shut down and a BMS alarm signal given.

Compliant...

Standards...

Acoustic Design of Schools: Performance Standards February 2015

About this publication.

The February 2015 document supersedes section 1 of 'Building Bulletin 93' (BB93) published in 2003. It sets out 'minimum' performance standards for the acoustics of school buildings, and describes the normal means of demonstrating compliance with the Building Regulations. It also provides guidance in support of the School Premises Regulations (2012) and the Independent School Standards (2013).

Changes in the performance standards categorise different types of school buildings.

- Temporary buildings
- New build
- Conversions and refurbishment (material change of use)
- Extensions.

Guidance for acoustic performance standards is outlined for different areas such as:

- Music rooms
- Drama rooms
- Multi purpose halls and assembly halls
- Special hearing needs students
- Lecture rooms
- Science labs
- Design and technology
- Art rooms
- Meeting rooms
- Kitchen and dining rooms
- Swimming pools
- Toilets and locker rooms
- Office and staff rooms.

Table 1... Noise Level Overview for IANL

Type of room	Room classification for the purpose of airborne sound insulation in Tables 3a and 3b		Upper limit for the indoor ambient noise level $L_{Aeq,30mins}$ dB	
	Activity noise (Source room)	Noise tolerance (Receiving room)	New build	Refurbishment
Nursery school rooms *Primary school:* classroom, class base, general teaching area, small group room Secondary school: classroom, general teaching area, seminar room, tutorial room, language laboratory	Average	Medium	35	40
Open plan: (See also section 1.8) Teaching area Resource/breakout area	Average	Medium	40	45
Primary music room	High	Medium	35	40
Secondary music classroom[1] Small and large practice/group room[1] Performance/recital room[1]	Very high	Low	35	40
Ensemble room[1] Recording studio[1]	Very high	Low	30	35
Control room - for recording[1]	High	Low	35	40
Control room - not for recording	Average	Medium	35	40
Lecture room	Average	Medium	35	40
Teaching space intended specifically for students with special hearing and communication needs[2]	Average	Low	30	35
SEN calming room	High	Low	35	35

Table 1 (cont)...

Type of room	Room classification for the purpose of airborne sound insulation in Tables 3a and 3b		Upper limit for the indoor ambient noise level $L_{Aeq,30mins}$ dB	
	Activity noise (Source room)	Noise tolerance (Receiving room)	New build	Refurbishment
Study room (individual study, withdrawal, remedial work, teacher preparation)	Low	Medium	40	45
Libraries:				
Quiet study area	Low	Medium	40	45
Resource area	Average	Medium	40	45
Science laboratory	Average	Medium	40	45
Design and technology:				
Resistant materials, CADCAM area	High	High	40	45
Electronics/control, textiles, food, graphics, design/resource area, ICT room, art	Average	Medium	40	45
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio/visual presentations, assembly, occasional music)	High	Low	35	40
Atrium, circulation space not intended for teaching and learning	Average	Medium	45	50
Sports hall Dance studio Gymnasium/Activity studio	High	Medium	40	45
Swimming pool	High	High	50	55
Meeting room, Interviewing/counselling room, video conference room	Low	Medium	40	45
Dining room	High	High	45	50
Administration and ancillary spaces:				
Kitchen	High	High	50	55
Office, medical room, staff room	Low	Medium	40	45
Corridor, stairwell, coats and locker area	Average	High	45	55
Changing area	High	High	50	55
Toilet	Average	High	50	55

Notes

[1] Music rooms – the levels of sound insulation between some music rooms may not be sufficient for particularly noisy activities and timetabling/management will need to be considered. Wherever possible music accommodation should make use of buffer spaces such as stores to increase the levels of sound insulation between rooms and to isolate rooms where very noisy activities such as drum practice will take place. If timetabling/management or isolation is not possible the levels of sound insulation should be increased. For further guidance on the design of music accommodation see 'Music Accommodation in Secondary Schools: a Design Guide', DfE, NBS/RIBA, 2010 Ref.12 and 'Acoustics of Schools: a design guide' Ref.1

[2] APSs are commonly required for these rooms and should be agreed by an acoustician and the school client body. See section 0.4.

In order to protect students from regular discrete noise events, eg, aircraft or trains, indoor ambient noise levels should not exceed 60 dB $L_{A1, 30mins}$. This is achieved by default for spaces with IANLs up to 40 dB $L_{Aeq, 30min}$, but requires assessment in spaces with higher IANL limits, eg, 45 and 50 dB.

Table 2... Summary of ventilation condition, system type and associated IANL tolerance

Condition	Ventilation system	Noise level limit
Normal - ventilation for normal teaching and learning activities	Mechanical[1]	Table 1 value
	Natural[2]	Table 1 value + 5 dB[4]
	Hybrid[2]	Mechanical system noise: Table 1 value
	Hybrid[2]	Total noise level: Table 1 value + 5 dB
Summertime[5] - ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hrs of the year	Mechanical Mechanical	Table 1 value + 5 dB[4] Table 1 value + 5 dB[4]
Intermittent boost[6] – ventilation under local control of teacher for dilution of fumes during practical activities as in practical spaces for science, art, food technology and design and technology	Mechanical Natural	Table 1 value + 5 dB[4] ≤55 dB
Process - extract[3] can be automatic ventilation for safety and/or under local control of teacher	Mechanical and/or natural	See IoA/ANC guide Ref1 for operational noise levels

Notes

[1] The normal condition for a ventilation system with purely mechanical air supply is defined as when the system is operating to limit the daily average carbon dioxide concentration to no more than 1,000ppm with the maximum concentration not exceeding 1,500ppm for more than 20 consecutive minutes on any day during normal school operating hours. This would normally equate to a minimum ventilation rate of approximately 8l/s per person. Mechanical ventilation in this context refers to systems (or parts of systems) that use mechanical fans to mix or drive the air including those in mechanical, hybrid, mixed mode and natural ventilation systems and in fan convector heaters.

[2] The normal condition for a ventilation system in natural or hybrid mode is defined as when the system is operating to limit the daily average carbon dioxide concentration to no more than 1,500ppm with the maximum concentration not exceeding 2,000ppm for more than 20 consecutive minutes on any day. This would normally equate to a minimum ventilation rate of approximately 5l/s per person. For hybrid systems, the mechanical noise excluding external noise break in, should meet the IANL figure in table 1.

The mid-season design condition can be used in simple ventilation calculations and is defined as an outside temperature of 11 °C and an internal air temperature of 20°C with no external wind effect.

Where external ambient free field noise levels at the facade expressed as the LAeq,30mins, do not exceed the IANL figures given in Table 1 by more than 16 dB for single sided ventilated spaces and 20 dB for cross ventilated or roof ventilated spaces, the criteria for natural ventilation can usually be achieved. However, the ventilation strategy still requires appropriate design of façade openings, height differences between low and high level openings, corridor transfer vents/stacks, etc, to limit the required façade open areas appropriately.

Where there is a hybrid system, any mechanical system components should meet the IANL limits from table 1. The total noise level including external noise ingress may exceed the IANL limit from table 1 by up to 5 dB.

[3] Process extract includes the operational noise from local exhaust ventilation systems and boost ventilation under the local control of the teacher as required for fume and dust extract in design and technology, odour and steam from cookers in food technology, fume cupboard extract and similar process extract systems. See guidance on specification and measurement of operational noise levels in 'Acoustics of Schools: a design guide' Ref.1. For example, for new fume cupboards the maximum noise level should not exceed 50 dB(A), measured at a height of 1,500 mm above the floor and 1,500 mm from the face of the fume cupboard, with the sash set at a height of 200 mm.

[4] The +5 dB does not apply to teaching and learning spaces where the Table 1 IANL is greater than or equal to 45 dB.

[5] Natural, mechanical or hybrid ventilation systems may be used to improve thermal comfort in summer at the expense of higher indoor ambient noise levels. The normal ventilation IANL can be exceeded during the hottest 200 hours in peak summertime conditions and the design should show that IANLs, defined in table 3 can be met under these conditions as well as under normal operation. The ventilation must be under the local control of the teacher so that the noise level can be reduced to normal levels when needed. This does not apply to classrooms intended specifically for students with special hearing and communication needs, or to speech therapy rooms.

The peak summertime condition is defined as the 200 hottest hours that occur using the design summer year (DSY) weather file during normal daily school operating hours including the summer holiday period. Thermal modelling and assessment of acoustic performance should be carried out as if the school were occupied through the summer holiday period. This corresponds to a much lower number of hours during normal term time (equivalent to typically 40 teaching hours in a school year) as most of the hottest hours occur during the holiday period.

[6] The noise level from locally controlled intermittent boost mechanical ventilation may exceed the IANL by up to 5 dB.

Table 3a... New build performance standards for airborne sound insulation between spaces

Minimum $D_{nT,w}$ (dB)		Activity noise in source room (see Table 1)			
		Low	Average	High	Very high
Noise tolerance in receiving room (see Table 1)	High	Not applicable	35	45	50
	Medium	40	45	50	55
	Low	45	50	55	55

Table 3b... Refurbishment performance standards for airborne sound insulation between spaces

Minimum $D_{nT,w}$ (dB)		Activity noise in source room (see Table 1)			
		Low	Average	High	Very high
Noise tolerance in receiving room (see Table 1)	High	Not applicable	30	35	45
	Medium	30	40	45	45
	Low	35	40	50	50

Table 4a... Performance standards for airborne sound insulation between circulation spaces and other spaces used by students, with no ventilator in the wall

Type of space used by students	Minimum R_w dB Composite R_w of wall and glazing with no ventilator		
	New build	Refurbishment	Doorset
Secondary school music room Control room – for recording Drama room Multi-purpose hall	45	40	35
Teaching space intended specifically for use by students with special hearing or communication needs Primary music classroom			
All other rooms used for teaching or learning	40	35	30

Table 4b... Performance standards for airborne sound insulation between circulation spaces and other spaces used by students, with ventilators in the wall

Type of space used by students	Minimum R_w dB Composite R_w of wall, glazing and ventilators dB			Alternative to composite R_w of wall, glazing and ventilators dB, provided values in Table 4a are provided by wall, glazing and doors Minimum $D_{n,e,w}$ – 10 lg N dB for ventilators
	New build	Refurb	Doorset	
Secondary school music room Control room – for recording Drama room Multi-purpose hall	38	35	35	37
Teaching space intended specifically for use by students with special hearing or communication needs Primary music classroom				
All other rooms used for teaching or learning	33	30	30	32

Table 6... Reverberation Time Tmf Seconds Overview

Type of room	T_{mf} seconds New build	T_{mf} seconds Refurbishment
Nursery school room *Primary school:* classroom, class base, general teaching area, small group room, SEN calming room	≤ 0.6	≤ 0.8
Secondary school: classroom, general teaching area, seminar room, tutorial room, language laboratory Study room (individual study, withdrawal, remedial work, teacher preparation) Science laboratory	≤ 0.8	≤1.0
Design and technology: Resistant materials, CADCAM area, Electronics/control, textiles, food, graphics, design/resource area, ICT room, art		
Open plan: Teaching area Resource/Breakout area	≤ 0.5 [see section 1.8] ≤1.2 [see section 1.8]	≤ 0.5 [see section 1.8] ≤1.2 [see section 1.8]
Music: Primary music room Secondary music classroom Practice/group room, volume ≤ 30 m^3 Practice/group room, volume > 30 m^3 Ensemble room, Live room Performance/recital room Control room - for recording Control room - not for recording	 ≤1.0 ≤1.0 ≤ 0.6 ≤ 0.8 0.6 - 1.2 [1] 1.0 -1.5 ≤ 0.5 ≤ 0.5	 ≤1.0 ≤1.0 ≤ 0.8 ≤1.0 0.6 - 1.2 [1] 1.0 - 1.5 ≤ 0.6 ≤ 0.6
Lecture rooms: Small (fewer than 50 people) Large (more than 50 people)	≤ 0.8 ≤1.0	≤1.0 ≤1.0
Teaching space intended specifically for students with special hearing or communication needs (See Section 0.4)	T ≤ 0.4 averaged from 125 Hz to 4kHz octave band centre frequencies and T ≤ 0.6 s in every octave band in this range.[2]	≤ 0.4. [2]
Library	≤1.0	≤ 1.2
Drama studio	≤1.0	≤ 1.0
Atrium, foyer, entrance hall, circulation space not used for teaching and learning	≤1.5	≤ 2.0
Assembly hall, multi-purpose hall (drama, PE, audio/ visual presentation, assembly, occasional music),	0.8- 1.2 1	0.8 - 1.5 [1]
Indoor sports hall, swimming pool	≤ (1.5 - 2.0) dependant on size of space. See section 1.6.[2]	≤ 2.0
Gymnasium/activity studio	≤1.5	≤ 2.0
Dance studio	≤1.2	≤1.5
Meeting room, Interviewing/counselling room, video conference room	≤ 0.8	≤ 0.8
Dining room	≤ 1.0	≤ 1.5
Administration and ancillary spaces		
Kitchen	≤ 1.5	≤ 2.0
Office, medical room, staff room	≤ 1.0	≤ 1.2
Corridor, stairwell	See section 1.7	See section 1.7
Coats and locker area, changing area, toilet	≤ 1.5	≤ 2.0

Notes

[1] Reverberation time should be within the indicated range, including the values given.

[2] APSs are commonly required for these rooms and should be agreed by an acoustician and the school client body. See section 0.4.

Table 8... Performance standards for speech intelligibility and privacy in open plan spaces – speech transmission index (STI)

Condition	Speech transmission index (STI)
Instruction or critical listening activity – within group	≥ 0.61
Between groups (during critical listening activities)	≤ 0.3

Notes

[1] A higher STI value may be more appropriate for students with special hearing or communication needs. Refer to 'Acoustic design of schools: a design guide' Ref.1 for further details.

STI should be calculated in accordance with EN 60268-16.

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Low Energy, Air Source Heat Pump System, Silenced with Acoustic Treatment as used in Hundreds of School Projects

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BSRIA

University of Salford MANCHESTER

Case Study:

Chorlton High School

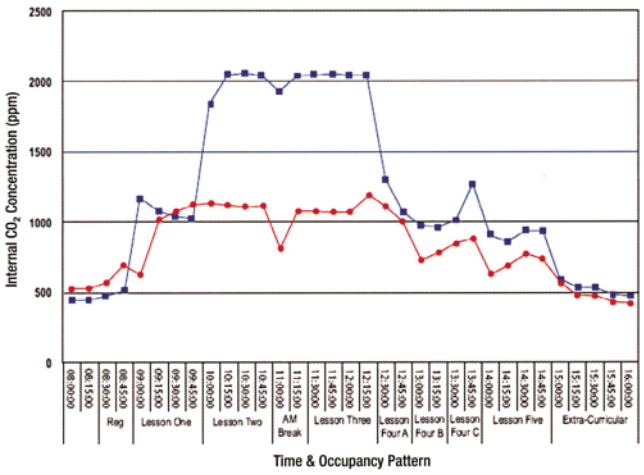
Chorlton High School, based in Greater Manchester was given a new lease of life in 2003 with a refurbishment and installation of a natural ventilation system.

Soon after, complaints of overheating and muginess were reported by the teachers and in August 2005, Manchester City Council approved the installation of the **Classvent** system as a trial in one of the classrooms.

Temperatures and CO_2 levels were monitored and compared to the adjacent classroom in which the original natural ventilation system remained.

Below is a graph indicating daily results.

Assessment of Internal CO_2 concentrations in Mechanical Ventilated Classrooms (15-09-2005).



As illustrated on the left, the mechanical ventilation system **(Classvent)** holds the CO_2 levels below the stipulated 1500 parts per million guideline. Data taken from the naturally ventilated room was taken with the windows open and CO_2 levels would rise even further should the windows be closed in the winter months.

The trial of the **Classvent** system in Chorlton High School has been a resounding success. The **Classvent** units will now be installed in further schools in the area under the Manchester BSF (Building Schools for Future Project.

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- Twin Fan Extract Units VTI and ITU
- Classvent Units
- Flat Series Void Units FPVU
- Packaged Void Units PVU
- Vertical Air Handling Units
- AH Series Modular AHU's
- IDG Series Indirect Gas Fired AHU's
- DG Series Direct Gas Fired AHU's
- HOSP Health Care Specification Hygiene AHU's
- AHW Welded Frame and Stainless Units
- TWHR Heat Reclaim AHU's containing Thermal Wheels
- AHR Heat Recovery AHU's containing Recuperators
- Freshcool Cooling only Packaged Units
- Envirofresh Packaged Heat Pump Units
- Attentuators and Anti-vibration Mounts
- Acoustic Enclosures and Screens
- Flat Pack Build and Refurbishment
- Planned Maintenance and Site Repairs

Other Associated Literature...

- Sound Advice for Ventilation Plant in Schools.
  By David Pinchbeck
- Air Handling Units Acoustic Insulation Performance test Report
- BSRIA Envirofresh Performance Test Report

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