NUAIRE HTM-03 SECTION 4 (BPS PACKAGED HEAT RECOVERY)

Section	HTM03-01 Section 4 Relevant Clauses	Nuaire comment BPS unit	Supplied As Standard	Not supplied as standard, but can be fitted at additional cost	BPS unit does not meet this requirement
1.29	Modern plants should be fitted with the means to recover energy from the extract air without causing contamination of the incoming supply air.	BPS are fitted with either a PHX or Thermal wheel.	✔		
4.4	Suitably positioned service connection joints and adequate spacing should permit these items to be withdrawn without the need to dismantle other installed plant or equipment. Batteries that are significantly wider than 1 m should be split to permit withdrawal from both sides.	BPS coils are wider than 1m and are currently not split with dual access. Dual access units require considerably more access space around the unit and this should be taken into account when designing the system.		✔	
4.5	It is essential that AHUs are positioned so that all parts are easily and safely accessible for routine inspection and service. If a unit is located against a wall or backs onto another unit, access to all parts must be available from the front. Units greater than 1 m wide should **preferably** have access from both sides or **have access doors large enough to permit the full and safe entry of maintenance personnel**.	Position of the unit is choice and design of our Customer. BPS units have large doors on one side for safe routine access.	✔		
4.11	Organic materials or substances that can support the growth of microorganisms must not be used in the construction of the plant or its distribution system. The Water Regulations Advisory Scheme's (WRAS) (2005) 'Water Fittings and Materials Directory' lists suitable materials for sealants and gaskets.	Due to the smooth internal design of the BPS unit there is no significant use of this material in contact with condensate in the unit.	✔		
4.12	The plant and its distribution system must not contain any material or substance that could cause or support combustion.	BPS unit currently uses a Polystyrene infill. This material can be upgraded at additional cost.		✔	
4.13	Plants should have a high standard of airtightness. **The double-skin method of construction with insulation sandwiched between two metal faces is recommended**. The panels may be available in a variety of colours at no additional cost. This can aid identification by colour-coding of units in a plantroom (for example green for general ventilation; blue for theatres; red for laboratories and isolation facilities; grey for extract etc).	BPS units deliver a superior L1 leakage class. They are available in different colours if required. Please contact Nuaire for a quote.	✔	✔	
4.14	The inside of the plant should be as smooth as possible. Channels, rolled angles or formed sections that could trap or hold moisture should be kept to a minimum. If stiffeners are required, they should be fitted externally. If internal bracing has to be fitted, it must be of a design that will not trap or hold moisture.	Unit is constructed using high quality thermally bridged aluminium extrusion which has smooth edges.	✔		
4.16	Access to items that require routine service such as filters, fog coils and chiller batteries should be via **hinged doors**. The doors should be large enough (for example 500 mm minimum) to allow easy access. Items requiring infrequent access, such as attenuators, may be via bolted-on, **lift-off panels**. All doors and panels should be close-fitting and without leaks.	Hinged doors are provided for all routine access modules with lift off removable panels for everything else. Access doors are greater than 500mm where possible.	✔		
4.18	It can be difficult to turn off AHUs in order to inspect filters and drainage trays. **Viewing ports and internal illumination** will therefore facilitate routine patrol inspection of such items. Viewing ports should be at a convenient height. In double-stacked units, placing the viewing ports at the bottom of the access doors of the upper unit will remove the need to use temporary ladders or steps when carrying out patrol inspections.	Filter and coil access panels do not currently contain viewing ports and due to the compact nature of the unit are unlikely to show anything of significance. Nuaire control philosophy (in line with ERP regulation) includes flow monitoring for fans and pressure differential monitoring for filters; these outputs can be linked to BMS systems which in turn can provide automated alarms negating the need for viewports. However, if view ports and lighting are required, they can be added at additional cost.		✔	
4.19	**Internal illumination** should be provided by fittings to at least IP55 rating. Fittings should be positioned so that they provide both illumination for inspection and task lighting. All lights in a unit should be operated by a single switch.	Internal lighting not provided in a BPS unit as standard, however, these can be fitted at an additional cost.		✔	
4.21	All items of plant that could produce moisture must be provided with a drainage system. **The system will comprise a drainage tray, glass trap, air break and associated drainage pipework.**	Nuaire provide a drain pan already installed in the BPS unit, however all other items (pipework etc.) by others.	✔		

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4.22	The drainage tray **should** be constructed of a corrosion-resistant material – stainless steel is preferred – and be so arranged that it will completely drain. To prevent "pooling", it is essential that the drain connection should not have an up-stand and that a slope of approximately 1 in 20 in all directions should be incorporated to the drain outlet position. The tray must be completely accessible or, for smaller units, easily removable for inspection and cleaning.	Drainage trays are made from corrosion resistant material. Upstand and drain runoff sufficient for PHX for PHX modules and cooling coils. Current coil design does not have a removable tray, however it can be cleaned by entering the unit.	✔		
4.27	The AHU should be arranged so **that most items are under positive pressure. Any item of plant requiring a drain should be on the positive pressure side of the fan.** A recommended layout is given in Figure 1	BPS unit is largely a suck through system. The LPHW and Cooling coils are under positive pressure, however the **PHX is under negative pressure** due to unit arrangement. There is also **no final filter** in the current BPS range, however, this can be provided as a separate module to be fitted downstream of our unit and we would be happy to provide a quote for this.			✔
4.29	An energy recovery system will normally be fitted between the supply and extract units.	Unit fitted with PHX or thermal wheel.	✔		
4.31	Motorised low-leakage shut-off dampers should be located immediately behind the intake and discharge of each supply and extract system respectively. They should be of the opposed-blade type, opening through a full 90 degrees, and must close automatically in the event of power failure or plant shut-down.	Dampers modules are available for ambient side of the system, but not currently for the supply side. These can be quoted if required.		✔	
4.32	4.32 The quality of motorised dampers is critical. They **should**: be rigid; • have square connections fitted with end and edge seals of a flexible material; and • have minimal play in linkages. The leakage on shut-off should be less than 2%.	Current BPS damper rods are circular and not currently of the low leak variety. Low leakage dampers with tip and edge seals can be added at additional cost.		✔	
4.35	Internal plant-isolating dampers are not required. Neither is the provision of fittings for shut-off plates between items within a unit.	BPS does not provide these as per the standard.	✔		
4.37	The following arrangement of plant components is typical, although in many instances not all elements will be required: a) fresh air intake; b) Motorised isolation/ smoke damper; c) frost/fog coil; d) Prefilter; e energy recovery device; f) attenuator; g) fan; h) blast plate; j) attenuator; k) chiller battery; m) eliminator; n) Heater battery; p) humidifier; q) final filter; r) manual isolation volume control damper	BPS unit is compact and does not follow the sequential requirements set out in 4.37 of components listed in this section. However, it does mention that this is a typical layout and that not all elements will be required. Please ensure that the BPS unit contains all the components you need to meet your design requirements. If in doubt then please contact Nuaire.	✔	✔	
4.46	Fans are normally positioned to "blow through" the central plant so that the cooling coil and humidifier drains will be under positive pressure.	Cooling coils are blow through as required. Humidifiers are not available with this range and can be fitted downstream by others.	✔		
4.64	It is necessary to ensure that – should the computer control system or its software develop a fault – the fan can be switched to a direct-start, fixed-speed manual operation. This is particularly important for **critical care systems serving operating suites, high-dependency care units of any type, isolation. Facilities, laboratories and pharmaceutical production suites.** Off-site software support is not a substitute for the ability of on-site staff to override automatic controls and keep the system operating in an emergency. Under these circumstances, actions that may shorten the life of the plant are considered of secondary importance to that of preserving the health and safety of patients and staff.	BPS units are fully BMS controlled, so there are no manual/auto/override facilities available. For this reason it is not recommended that BPS units be used for the applications listed in bold adjacent as per clause 4.64. alternatively a non controlled BPS unit can be provided where controls can be designed and fitted by others.		✔	
4.65	Fog/frost heating coils are installed to protect the downstream filters from low-temperature, high humidity intake air conditions. As they handle unfiltered air, they **should** be constructed of plain tubing without fins and be as near to the outside as possible to minimise condensation during cold weather. Access for cleaning will need to be provided to both sides of the coil.	Current frost coils have large pitch aluminium fins on copper tubing, however, these can be changed to the more expensive copper/copper finless type if required. Please contact Nuaire for a quote.		✔	
4.67	Main and branch heater-batteries **should** be constructed of solid-drawn copper-tube coils with copper fins, generally connected in parallel.	Current LPHW coils have small pitch aluminium fins on copper tubing, however, these can be changed to the more expensive copper/copper finned type if required. Please contact Nuaire for a quote.		✔	
4.69	Access for cleaning **must** be provided to both sides of all fog coils and heater-batteries.	The BPS unit is compact and heating and cooling batteries are adjacent. There is upstream access for cooling battery and downstream access for heater battery.			✔

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4.75	LPHW fog/frost coils **should** be controlled by an off-coil temperature sensor operating a motorised valve to provide a minimum plant "on temperature" of between 2oC and 5oC. The off-coil temperature of the frost coil is generally sensed by a serpentine thermostat downstream of the coil or upstream of the next plant item. This thermostat will shut the fan down if any part of the air stream is below the minimum set-point.	Current control logic will allow this for BMS control versions.	✔		
4.78	Heater-battery control valves **should** automatically close on system shut-down or fan failure. The control system should then automatically set to provide **frost protection**.	This is how the current BPS control logic works. For more information please refer to the controls section of the BPS I&M.	✔		
4.79	Cooling coils will need to be periodically cleaned or decontaminated. They must have good access both up- and downstream. Hinged access doors with viewing ports and illumination inside the duct should be provided both sides of the coil.	Coils do not have access on both sides for cleaning. They do not have hinged doors (due to the pipework protruding through them) and they don't have portholes due to the lack of space between coil modules. This is not currently available with the current BPS range.			✔
4.8	An **eliminator will be required downstream** of all cooling coils. The eliminator may take the form of an extension of the coil fins or be a separate device. If a separate device, it should be removable as a unit to permit cleaning of the coil face.	BPS coils do not currently have eliminators as standard due to them being sized correctly for the air velocity. Eliminators can be fitted at additional cost, please contact Nuaire for a quote.		✔	
4.81	**All cooling coils must be fitted with their own independent drainage system** as specified above. A baffle or similar device must be provided in the drain tray to prevent air bypassing the coil. The tray should be large enough to capture the moisture from the eliminator, bends and headers.	All BPS coils have fitted drain trays.	✔		
4.82	Where coils are greater than 1 m high, intermediate drain trays are needed.	Intermediary drain trays not currently fitted, however these can be provided at additional cost.		✔	
4.84	Care must be taken to minimise electrolytic action resulting from condensation on the air side. Coils constructed from copper tubes with copper fins extended on the downstream side in the form of an eliminator, and electro-tinned after manufacture, are preferred. **Aluminium fins should only be used if vinyl-coated.**	Copper Aluminium coils are currently used and can be treated as per clause 4.84. If the Customer requires copper/copper coils then these can be quoted additionally if needed.		✔	
4.85	All parts of the coil and its associated ductwork in contact with moisture must be **manufactured from corrosion-resistant materials**. Pressed-steel coil headers, even if treated, have been shown to be prone to corrosion over time and **should** not be used. Steel mounting frames and casings present similar problems, **so stainless steel is preferred.**	Stainless preferred, however current unit design is based on Aluzinc base material, aluminium drain pans where possible and galvanised treated coil frames and drain pans.	✔		
4.86	Cooling coils in AHUs should be located upstream of the final filter	BPS units do not have final filter option, however a separate filter can be provided to be located downstream of the unit - please contact Nuaire for a quote.		✔	
4.117	Filters must be securely housed and sealed in **well-fitting frames that minimise air bypass**. Air bypass significantly reduces filtration efficiency: the higher the filter grade, the greater the effect. Mounting frames **should be designed so that the air flow pushes the filter into its housing** to help minimise air bypass. **Mounting frames that withdraw so that the filter can be changed without having to reach into the unit are preferred**.	BPS filter systems slide out from the side for easy access and meet all the requirements of 4.117.	✔		
4.118	Neither the filter media nor any material used in the construction of the filters should be capable of sustaining combustion. The filter media should be such that particles of it do not detach and become carried away by the air flow.	Cardboard frames for panel filters and plastic filter frames for M5 extract are currently used. Supply filters are of the bag variety with galvanised frames. All frames can be changed to steel if needed at additional cost.		✔	
4.119	Filters need to be readily accessible for replacement; therefore, **a hinged access door should be provided**. **The upstream side of the filter should be visible for inspection through a viewing port with internal illumination.**	There are currently no portholes or lights fitted to the BPS module: these can be provided at additional cost.		✔	
4.12	All filters should be provided with a means of **visually checking the differential pressure across them**. Direct-reading dial-type gauges marked with clean and dirty sectors are preferred.	Current unit does not allow visual inspection, but rather BMS inspection through central terminal. I would consider this alarm feature better than a visual inspection and for this reason a pass.	✔		
4.121	A complete spare set of filters **must** be provided to the client at handover	Not currently provided with the BPS unit however happy to provide a quote for these.		✔	

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4.129	Panel filters are cheap and disposable with relatively low dust-holding capacity. They are generally used as prefilters to eliminate large particles which would otherwise clog or cause damage to the fan and finned heating and cooling batteries. **Stainless steel** frames that hold disposable pre-cut filter pads are more economic, create less waste and are therefore the preferred option.	Filter frames are a corrosion resistant Aluzinc construction which hold disposable filter panels and bags. Please note these are not stainless.	✔		
4.130	General ventilation supply plant should incorporate primary air filters of grade G3, sized for a maximum face velocity of 2 m/s. Additional coarse prefilters may be justified where the intake air is exceptionally polluted. They are sometimes fitted as a temporary measure when building work is being carried out in the vicinity of the air intake.	For this application we would limit the velocity through the unit to 2 m/sec.	✔		
4.131	Where a higher standard of filtration is required, secondary bag or pleated-paper panel filters can be used. Rigid frame filters incorporating pleated paper elements are **preferred** over bag filters for critical care applications such as operating theatres	BPS units use panel and bag combination. Operating and other critical areas excluded as per 4.64.	✔		
4.134	HEPA filters	No HEPA filters available in the range.			✔
4.140	Active Carbon	No carbon filters available in this range.			✔
4.146	**Energy recovery must be fitted to all healthcare ventilation systems.** It may be omitted only where it would clearly be uneconomic (for example to a single WC extract system).	BPS delivers this requirement.	✔		
4.147	**For systems in healthcare premises, a plate heat exchanger or "run-around coil" system is suitable.** Thermal wheels may be used providing they are **fitted with a purge sector**. The small amounts of air leakage across these devices are not considered significant. Other systems such as heat pumps or heat pipes are also suitable. Selection should be based on the relative locations of the supply and extract units, ease of maintenance and practicality. Cleaning access will be required to both sides of any energy-recovery device.	Plate Heat Exchangers available as standard. Thermal wheels available as standard (fitted with purge sector).	✔		
4.148	4.148 The following are the **minimum energy transfer efficiencies** required for devices handling equal air volumes: • run-around coil – 45%; • **plate heat exchanger – 50%;** • **thermal wheel – 65%;** • any other energy-recovery device – 50%.	BPS unit exceeds this via the ERP legislation.	✔		
4.149	If a plate heat exchanger is chosen, the plates should be **constructed of metal.** An internal bypass is not always required but, if fitted, **plastic should not be used for the internal dampers and drive gears.**	Current PXH unit has a metal heat exchange matrix, however, the gearing system is made of strong plastic gears secured to metal rods. Nuaire consider this to be a robust solution and our standard execution. However, if plastic gears are to be avoided then the **bypass can be removed altogether.**		✔	
4.15	Whichever energy-recovery device is chosen, the extract side will need to be protected by a G3 filter and provided with a drainage system (as described above) to remove condensate.	Superior M5 filter provided as standard.	✔		
4.163	The noise levels produced by ventilation and other plant should be reduced by either lining the inside of the duct with sound-absorbing material or fitting bespoke attenuator units.	Matched attenuators are available for BPS units.	✔		
	Bespoke attenuator units with a **sound-absorbing in-fill suitable for the quality of air being handled and protected by a perforated sheet metal casing are the preferred option for critical systems.** Absorption of moisture, dirt and corrosive substances into the "in-fill" and the release of fibrous particles into the air stream should be **prevented by the use of a membrane.** The membrane material should have a declared service life of at least 25 years. If these conditions can be met, the attenuator may be located in the supply ductwork downstream of the final filter. When so located, cleaning access should be provided at both ends of the attenuator unit.	BPS attenuators are not currently lined with a membrane. However, if needed this can be added at an additional cost. Alternatively these can be provided by others.		✔	

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6.12	Computer-software-driven control systems are becoming the norm in building services. However, healthcare ventilation systems need to be available for operation outside of normal working periods when software support is not available. Should the software fail, it will be left to site staff, who may have little knowledge of the control algorithms, to restart the ventilation system. It is therefore essential to ensure that a simple means of restarting critical systems in the event of a software failure is provided (see also paragraphs 4.62–4.63).	BPS units are fully BMS controlled and as large capital equipment they rely on being operated by trained personnel. If this feature is required then we recommend using our non-controlled BPS versions and then allow the controls to be designed and fitted by others.		✔	

General notes and Exclusions

The clauses above have bee taken from the HTM03-01 "Health technical memorandum 03-01: specialised ventilation for healthcare premises" document (ISBN 978-0-11-322805-8) and focusses specifically on items related to the unit itself covered in section 4: "air handling unit design and specification guidance"; it is the designers responsibility to ensure that the unit meets the HTM03 document in full.

BPS units should not be used to ventilate any of the following areas:
- Medicine Manufacturing
- Laboratories where failure of the ventilation system may result in risk to individuals coming in contact with pathogens or other harmful substances.
- Any life critical systems where the wellbeing of the patient/staff is directly linked to the ventilation system
- Operating Departments, Laboratories, Pharmacies, areas containing identified biological or chemical hazards, areas containing oxygen displacing gases, enclosed workspaces

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