

# Technical Fact Sheet – How to get the best out of Fan Coils.



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This guide gives an overview of how to get the best out of fan coils units throughout the life of your building. The below constitutes general guidance from the FETA fan coil manufacturers' group based on general principles. It's always worth engaging with the original manufacturer for tailored advice to your building.

## Design Stage

Getting the best out of fan coil units starts with the design of the building. Units should be sized correctly for the space they are serving. Undersized units may struggle to maintain desired temperatures, while oversized units can lead to temperature fluctuations causing reduced efficiency and uneven comfort levels.

As the output of a fan coil unit is intrinsically linked to the water temperatures, ensure that all the terminal unit equipment, not just the fan coil units, are selected based on realistic and achievable water temperatures, not just arbitrarily chosen design values.

Fan coil units should be properly positioned to address local heat gains or losses from external sources such as direct sunlight, exterior walls, or windows. Units with higher cooling demands (IT rooms, higher occupancy offices) will require larger units to meet the demands. Estimated heating and cooling loads should be calculated from industry guidance such as CIBSE Guide B or BSRIA Rules of Thumb.

Control strategies should be structured to complement the operation of the fan coil unit, rather than hinder it. By using variable speed fans and larger heat exchangers, fan coil units can be used to quickly heat, or cool areas compared to other heating systems like underfloor heating, and this should capitalise on energy and carbon savings. The use of occupancy detection, nighttime setbacks and zoned control, can be used to adjust setpoints throughout the course of the day in response to the occupants' requirements.

Occupancy detection using widely and commercially available PIR sensors or CO2 monitoring can be integrated with modern access control systems to build up an accurate picture of who's in a building. Less frequented areas can then use a wide-ranging setback temperature as thermal comfort becomes less important. Areas that are very rarely occupied can have even wider ranging setpoints focused more on protecting the building's fabric or contents.

Large spaces should be zoned to ensure that adjacent units don't get into conflict with the heating from one unit, fighting against another that is cooling. Zoning will also simplify the work for the control's integrators and FM teams, as it's less information at the head end to present and interpret and makes setpoint adjustment more efficient. Very large areas such as open plan offices, or areas with high ceilings should be considered for multiple zones, particularly when looking at offices where multiple teams may be located with different shift patterns.

Integration into the building's ventilation system should be defined to allow for free cooling and indoor air quality. As fan coils are typically just recirculation devices, by integrating with AHUs, the fan coil can add better localised thermal comfort as required, as well as being used to aid air distribution around spaces more evenly.

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CIBSE TM43 shows how fresh air is typically ducted in above suspended ceilings and by using fan coils, this can be more evenly distributed throughout the space, rather than relying on typically larger ductwork that can have associated noise from other areas or central plant.

Fan coil units with EC motors are now deemed an industry standard due to the Specific Fan Power (SFP) requirements in UK Building Regulations Part L. Beyond improved SFPs, they also allow for variable speed control of the fan. Unit controls from either the fan coil manufacturer or a systems integrator should make use of this and ensure that the fan speeds can ramp up or down to suit the duty requirements of the space. Acoustic comfort is also improved, and occupants will be less disturbed by a slowly changing fan speed rather than older style stepped fan speed.

Where variable speed control is specified within the building's control and energy efficiency strategy, the selection of appropriate air terminal devices, that can accommodate the peak fan coil volume flow, as well as the design set back volume flow must be considered. To maintain user comfort throughout the year, the commissioned set-back volume flow should not fall outside of the operational range of the connected air terminal device.

The positioning of the unit should consider access for maintenance and repair. It's inevitable that the unit will require servicing over its lifetime and access should be readily available for the facilities maintenance team after handover.

Build soft landings and commissioning of units into the project scope of works from the start. The usage of buildings and spaces can change throughout the design process and it's important that soft landings and commissioning are carried out to ensure it's fit for purpose. As a designer you have a responsibility to ensure provision is made to validate that the design is working correctly.

### Installation

The installation of Fan Coil Units is one of the best opportunities to build in quality to the M&E package of the project. Picking up from the design stage, the installation contractor should avoid value engineering fan coils with simpler controls, smaller units, or inferior quality components.

Once activities on site start, units should be installed in locations that allow access for servicing and maintenance to ensure the unit can be kept in working order. Particular attention should be paid to the positioning of sensors, and to ensure that localised draughts from other fan coil units or other services are kept to a minimum.

Electrical supplies should be installed close to the unit and allow for easy isolation to aid services.

Secondary ductwork systems should be inspected, and any leaks sealed to prevent air loss and improve system efficiency. Leaky ducts can waste energy and reduce the effectiveness of Fan Coil Units. Manufacturers

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will qualify their units' acoustic performance based on typical installations and it's important these are followed in the performance is expected to be achieved. The generally accepted installation is spiral wound ductwork should be used as the same diameter as the Fan Coil Units' spigots with flexible ductwork being used on the last meter. Unused spigots should be considered in the context of the Fan Coil Unit schedule issued by the manufacturer to ensure that in-duct air velocities are controlled. Properly sized ductwork combined with suitably placed diffuser boxes will help to minimise temperature variations and maintain comfort levels.

Pipework to the unit should be well insulated with all exposed parts of the hydronic system covered. Where pipework joins onto the unit, the insulation must extend over the drain tray to avoid condensation forming and dripping onto the ceiling below.

Finally, as much as fan coils are typically about ducting on the supply air side, the return air path is equally important. The path should be clear of any obstructions, and the units can draw either from the ceiling void or a ducted intake. Installations where the Fan Coil Unit supplies air from one space into another with no discernible air path between them should be avoided at all times. Such a design can restrict the airflow, resulting in increased noise and wear on the fan coil unit.

### Commissioning

Commissioning of a project is often rushed and compromised to account for other larger project delivery failures that happened earlier in the timeline. The importance of commissioning a project cannot be understated and should be completed by experienced and knowledgeable engineers who understand the systems and the intent of the systems' design.

All Fan Coil Unit manufacturers will include guidance in their product instructions on what and how to commission their units and this should be followed closely. The schedule as designed should be used to confirm unit performance and any identified issues should be reported and remedial plans made to resolve. Consideration should be given to both a 'Winter' commissioning (of heating systems) and a 'Summer' commissioning to ensure the unit control and functionality is correct.

### Usage

Throughout the use phase of a Fan Coil Unit's life, there are steps that can be taken to get the best use out of the unit. Firstly, simple controls should be used to keep any education for users to a minimum. Some installations ask for an explanation of the fan coil unit controls to be printed and placed next to the wall controllers to explain their operation to those in the room.

Whether the building uses Fan Coil Units or not, there is always a benefit to educating occupants about energy-saving practices. Simple actions such as closing windows and doors, adjusting blinds to block direct sunlight, and avoiding unnecessary use of Fan Coil Units can help conserve energy and maximise the building system's efficiency.

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As the use of buildings change and adapt over time, it's likely that the demands on the building services for that room will also be impacted. Will the change require more heating, cooling, or ventilation, are all questions that building owners should consider.

The most important aspect of a buildings use though is to ensure robust Maintenance procedures are in place and followed.

## Maintenance

Good maintenance starts with a plan, and this should cover both units' locations, the schedule of work needed and the training and development of those completing the work. In the current age of facilities management companies, most building owners will outsource this work to 3<sup>rd</sup> parties, but the levels or service offered and skillsets available should be agreed up front. Regular training for building operators and maintenance staff should be carried out on the proper operation, maintenance, and troubleshooting of fan coil units. Well-trained personnel can identify issues early, perform preventive maintenance tasks, and ensure optimal performance of the equipment. The cleaning or replacing of air filters, checking, and lubricating fan motors (if required), inspecting coils for dirt buildup, and ensuring proper drainage of condensate systems are all typical routine maintenance activities.

The maintenance of buildings can be expensive, and refurbishment of fan coils can be used as a cheaper alternative than new unit installation. Typically, inefficient AC motors can be replaced with more efficient EC motors, and controls can be upgraded with new more intelligent controls, with better looking and suited interfaces. The labour cost for replacement is much higher on refurbishment projects than straight forward unit replacement, and so the total cost of the work should be considered.

Whilst carrying out maintenance work, it's typical for building owners to want to address other areas of their indoor space environment, and principally this is indoor air quality. Fan coil manufacturers can be consulted about installing air quality enhancement features such as UV germicidal lamps or advanced filtration systems to improve indoor air quality. The cleaner air not only enhances occupant comfort but also prolongs the lifespan of the FCU components. The temptation to fit highly resistive or fine filters (such as HEPA) should be avoided. Such filters are typically not suitable for standard fan coil units and requires stages of filtering to avoid becoming quickly blocked resulting in severe degradation of the Fan Coil Units' performance.

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