

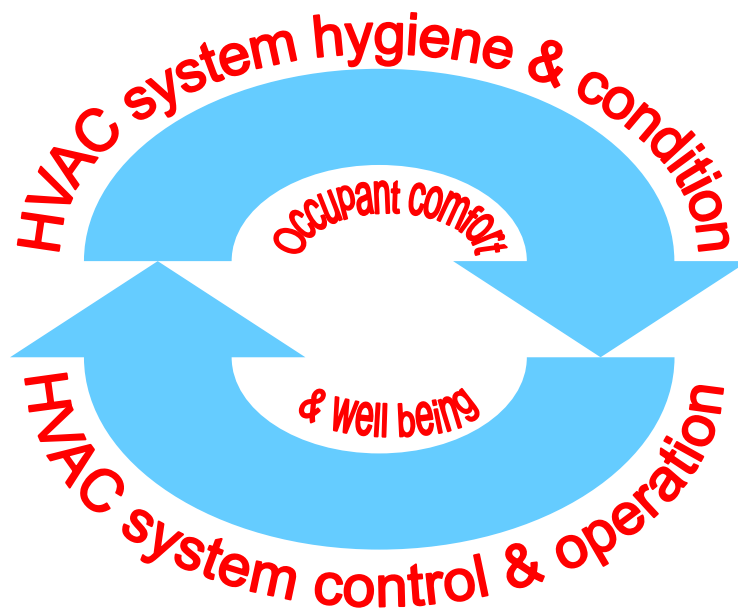


## Building Systems Health Check

### Background

In over 20 years of continuing service, the core business of HBI has been ventilation system hygiene and condition checks, typically performed on a six monthly or annual basis. HBI can now offer a new service to also assess the control and operation of ventilation systems. HVAC system performance is equally as important as hygiene to the comfort and well-being of building occupants and this new service will help ensure that systems operate as expected and required. Maintenance personnel perform routine tasks on plant and components to ensure continued performance but for a true indication of system performance it is necessary to look at the bigger picture and understand how they are connected and interact. This is the value of and HBI Building Systems Health Check:

The addition of system control and operation checks means that HBI can offer a **wide-ranging HVAC service which is unique in environmental consultancy** and encompasses all aspects that contribute to the success, or otherwise, of HVAC systems. It should be noted that the Building Systems Health Check tests and inspections are performed without interfering with the existing control systems/settings



### Benefits

The potential benefits of a Building Systems Health Check include:

- Verification of system performance
- Prevention of potential problems
- Identification of problems or problems before they become critical or even before they are known.

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Verifying current system performance provides information that can be used in many ways. For example, it will help the controls contractor improve performance and provide useful information on system operation and maintenance. It may also identify inherent system design weaknesses or problems that have developed through refurbishment of offices or changes of use in certain areas, in addition to short-term faults. These are inevitably a significant drain on maintenance resources and the Health Check may provide you with the evidence needed to present a case for more radical overhauls. In addition, by identifying where problems do and do not occur, the Health Checks may help target maintenance effort to areas of greatest need, thus making better use of budgets. The Health Checks may even improve response times to workforce environment complaints through the enhanced system knowledge that they provide.

Potential problems can sometimes be prevented because the Health Check identifies small performance irregularities before they become fully blown faults. Preventing problems has many potential benefits including maintenance cost savings, as problems that are caught at an early stage are typically cheaper to fix; energy savings; prevention of the building being labelled as sick; a happier, healthier, more productive workforce; helping to achieve personal and department targets in terms of a smooth operation and reduced workforce complaints.

The Health Check may also identify problems that were previously unknown. For example, terminal units can be subject to a number of faults and failures but, as the units are often installed in ceiling voids where they are out of sight and out of mind, so problems may go undetected. The potential benefits include reduced long-term maintenance costs, help in targeting maintenance efforts more effectively, particularly where the problem is inherent to the system type, and reduced energy bills.

Finally, regular Health Checks may help identify problems before they become critical and this can result in significant maintenance cost savings. It may also result in very significant business cost savings, particularly if the indoor environment is critical to business operation e.g. data centres.

To reiterate, the potential benefits of a Building Systems Health Check are wide-ranging and may include significant cost savings that often far outweigh the cost of performing the checks. The small investment required may produce significant savings for your department or business in the long term by removing much of the day to day reactive 'fire-fighting' that is often associated with operating and controlling HVAC systems.





## The Building Systems Health Check Explained

The Building Systems Health Check Service **does not interfere with the existing control systems in any way** but does assess whether they are operating satisfactorily. This is achieved by a combination of visual inspection and logging parameters such as outside air, supply air and space temperatures. Small, unobtrusive loggers (see below) record conditions in parallel with existing controls. The service can assess:

### Air Handling Units

- Terminal Units
- Perimeter Heating
- Heating/Cooling Optimisers.



### Air Handling Units

Health Checks on Air Handling Units are achieved by observing system response to changing conditions and assessing whether this is satisfactory. The Health Checks includes the following:

- Visual inspection of sensor locations for unrepresentative influences including space/return air, outside air, supply air (temperature/relative humidity/velocity/static pressure) sensors.
- Visual inspection of sensors for cleanliness and signs of damage (temperature/relative humidity/velocity/static pressure).
- Visual inspection of valve and damper actuator connections and condition.
- Logging of the outside air, space and air supply temperatures throughout the day. This would preferably be at locations next to the relevant control sensors.
- Visual inspection, at regular intervals during the logging day, of the plant operation including damper positions/operation of heat recovery and heat/chill coil operation/valve positions.

If required, the check can also include an assessment of control zoning by comparing the temperature logged near the control sensor to that in other areas being controlled by the same sensor.





## **Terminal Units**

Health Checks on Terminal Units involve logging space and supply air temperatures and recording responses to changes in set point. The service also includes a visual inspection of the relevant sensor locations and conditions.

## **Perimeter Heating Systems**

Perimeter Heating Systems Health Check are performed by logging space, outside air and heating system pipe temperatures and comparing the actual pipe temperature to that expected from the compensated circuit control. The check also includes a visual inspection of the location and condition of the space sensor/thermostat, outside air sensor (where applicable) and valve actuator condition (where applicable). If required, the check can also include an assessment of control zoning by comparing the temperature logged near the control sensor to that in other areas being controlled by the same sensor.

## **Heating/Cooling Optimisers**

The optimiser is an important control function often applied to temperature control to provide an energy efficient way of ensuring conditions are comfortable at occupancy. This is achieved by varying the time that the system switches on according to load. Optimiser performance is assessed by logging temperature over several days to highlight conditions at initial occupancy, particularly on a Monday morning after a system has typically been off all weekend. Depending on how the optimiser works, the temperatures logged could include space, heating system flow and outside air. The check also includes a visual inspection of the space sensor and outside air sensor (where applicable) location and condition.



## Examples of Findings from HBI Air Quality Inspection Reports

### Visual Inspection of System Components

This outside air temperature sensor was laden with dirt which was impairing accuracy. The fault was corrected by cleaning of the sensor.

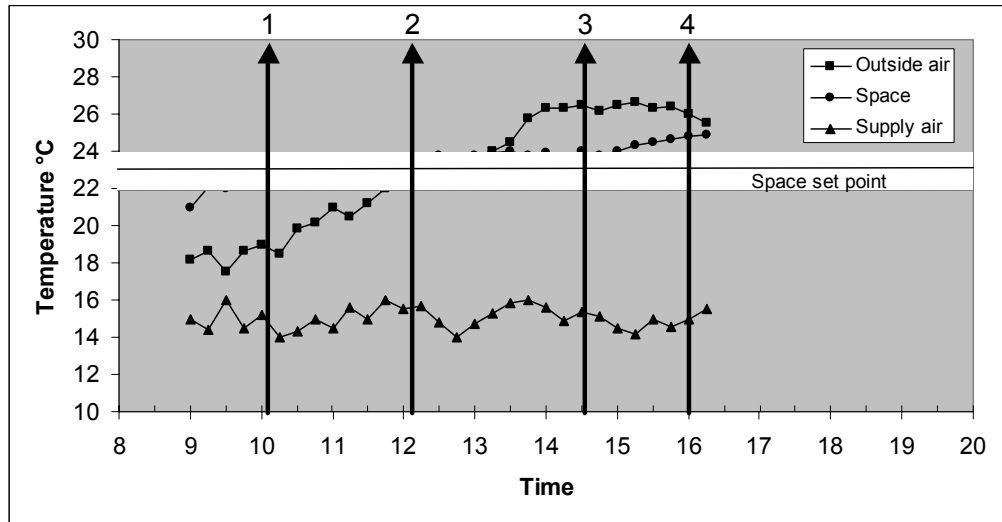


This actuator on the AHU outdoor air damper had become disconnected from the damper spindle. It was re-fitted, as a matter of some urgency, to ensure the adequate supply of outdoor air.

Both the heat and chill coil valves in this AHU were found to be fully open as indicated by the valve positions and coil temperatures. This was not only wasteful in terms of energy but prevented the desired supply air temperature from being achieved and, consequently, impaired occupant comfort.



## Control System Performance



Test Point	Test time	Outdoor air damper %	Return air damper %	Heat coil %	Chill coil %
1	10.05	10	90	0	20
2	12.10	100	50	0	20
3	14.32	10	90	0	50
4	16.00	10	90	0	50

At Test Point 1, the chill coil was on even though free cooling was available. It is possible that the outdoor air sensor is exposed to the early morning sun and consequently records the temperature as higher than it actually is.

The damper positions at Test Point 2 were unusual as the outdoor air was fully open and the return air partially open. It is typically the case that a single control signal operates all the dampers, but in opposition, such that as one opens, the other one closes. It is recommended that the return air damper operation be checked as it may be slipping on the actuator.

Between Test Points 3 and 4, the chill coil opening and supply temperature remained relatively constant despite the space temperature drifting significantly. This may indicate a problem with the chill coil valve and it is recommended that the operation is verified by comparing the control signal to valve opening. Other potential causes which should be checked include the minimum supply air temperature set point being set too high or poor space sensor accuracy.





## CONCLUSION

Building Systems Health Checks can:

- Produce significant cost savings in terms of maintenance and energy
- Provide information to help you manage your building more effectively
- Help reduce complaints, leading to a happier, healthier, more productive workforce.
- Take reasonable steps to find materials in premises likely to contain asbestos and check their condition.
- Presume that materials contain asbestos unless there is strong evidence to the contrary.
- Make a written record of the location and condition of asbestos and presumed asbestos containing materials (ACMs). Keep this record up to date.
- Assess the risk of anyone being exposed to these materials.

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