

Hydro-X Air

Ventilation Hygiene Risk Assessment Report

CRM Number No:

On behalf of

Client

At

Building Name

System Name



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Section 1: Preface

Customer:	Customer
Site Address:	Site Address
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Hydro-X Operatives Carrying Out Works:	Site personnel name
Date of Assessment:	Date

Any further information concerning this assessment should be requested by contacting the above-named Hydro-X Account Manager.

Section 2: Introduction

The following report relates to the ventilation hygiene assessment carried out at the site on (date).

The purpose of this survey is to ascertain the internal cleanliness of the ventilation system(s) as listed below, to meet the employer's statutory duty to properly maintain them. This was carried out by means of internal visual inspection, supported by a variety of surface deposit measurements. In essence: the purpose was to find out whether the systems were sufficiently clean or required internal ductwork cleaning.

The brief was to concentrate on those parts of the ventilation systems which are not normally inspected or actively maintained, i.e., the ductwork running out in the served areas as opposed to the more usually accessible ventilation air handling plant and plantroom ductwork.

On grounds of minimising disruption to normal hospital/building operations the inspections were to be carried out from the more easily accessible openings such as grilles and diffusers, and possibly via less obtrusive fire damper access locations etc. Only in carefully considered circumstances should ceiling tiles be lifted or other more obtrusive actions be taken, as this may have disturbed any soiling present.

This survey is by no means exhaustive but is designed to identify the risks from internal surface soiling levels, with minimum cost and disruption.

Section 3: Legislation, Standards & Guidelines

What the Law Requires You to Do

The Health and Safety at Work etc Act 1974:

Employers have a duty under the Health and Safety at Work etc Act 1974 to ensure, so far as reasonably practicable, the health, safety, and welfare of their employees at work. People in control of non-domestic premises have a duty towards people who are not their employees but use their premises. The Regulations expand on these duties and are intended to protect the health and safety of everyone in the workplace, and ensure that adequate welfare facilities are provided for people at work

The Workplace (Health, Safety and Welfare) Regulations 1992 – ACOP & Guidance

The Workplace (Health, Safety and Welfare) Regulations 1992 cover a wide range of basic health, safety and welfare issues and apply to most workplaces (with the exception of those involving construction work on construction sites, those in or on a ship, or those below ground at a mine – see regulation 3).

Requirements Under These Regulations

Employers have a duty under the Health and Safety at Work etc Act 1974 to ensure, so far as reasonably practicable, the health, safety, and welfare of their employees at work. People in control of nondomestic premises have a duty towards people who are not their employees but use their premises. The Regulations expand on these duties and are intended to protect the health and safety of everyone in the workplace and ensure that adequate welfare facilities are provided for people at work.

Duties under these Regulations

People other than employers also have duties under these Regulations if they have control, to any extent, of a workplace. For example, owners, landlords or managing agents of business premises should ensure that common parts, common facilities, common services and means of access within their control comply with the Regulations.

Risk assessment

As part of managing health and safety you must control the risks in your workplace. This document will help you to do this. You need to think about what might cause harm to people and decide whether you are doing enough to prevent that.

Regulation 5 Maintenance of workplace, and of equipment, devices, and systems

- 1) The workplace and the equipment, devices, and systems to which this regulation applies shall be maintained (including cleaned as appropriate) in an efficient state, in efficient working order and in good repair.
- 2) Where appropriate, the equipment, devices, and systems to which this regulation applies shall be subject to a suitable system of maintenance.
- 3) The equipment, devices, and systems to which this regulation applies are:
 - a) equipment and devices a fault in which is liable to result in a failure to comply with any of these Regulations.
 - b) mechanical ventilation systems provided pursuant to Regulation 6.
 - c) equipment and devices intended to prevent or reduce hazards.

Approved Code of Practice (ACOP 5)

- 41) An 'efficient state' means that the workplace and the equipment, devices and systems mentioned in these Regulations should be free of faults likely to affect the health, safety or welfare of workers and provide an adequate level of hygiene. If a potentially dangerous defect is discovered, the defect should be rectified immediately, or steps should be taken to protect anyone who might be put at risk.
- 42) Equipment that could fail and put workers at serious risk should be properly maintained and checked at regular intervals, as appropriate, by inspection, testing, adjustment, lubrication, repair, and cleaning.

Regulation 6 Ventilation

- 1) Effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air.
- 2) Any plant used for the purpose of complying with paragraph (1) shall include an effective device to give visible or audible warning of any failure of the plant where necessary for reasons of health or safety.

Approved Code of Practice (ACOP 6)

- 47) Enclosed workplaces should be sufficiently well ventilated so that stale air, and air which is hot or humid because of the processes or equipment in the workplace, is replaced at a reasonable rate.
- 48) The air, which is introduced should, as far as possible, be free of any impurity which is likely to be offensive or cause ill health. Air which is taken from the outside can normally be considered to be 'fresh'. However, air inlets for ventilation systems should not be sited where they may draw in contaminated air (for example close to a flue, an exhaust ventilation system outlet, or an area in which vehicles manoeuvre). Where necessary, the inlet air should be filtered to remove particulates.
- 49) In many cases, windows or other openings will provide sufficient ventilation in some or all parts of the workplace. Where necessary, mechanical ventilation systems should be provided for parts or all of the workplace.
- 50) In the case of mechanical ventilation systems which recirculate air, including air-conditioning systems, recirculated air should be adequately filtered to remove impurities. To avoid air becoming unhealthy, purified air should have some fresh air added to it before being recirculated. Systems should therefore be designed with fresh-air inlets, which should be kept open.
- 51) Mechanical ventilation systems (including air-conditioning systems) should be regularly and adequately cleaned. They should also be properly tested and maintained to ensure that they are kept clean and free from anything which may contaminate the air.

Guidance

- 57) The fresh-air supply rate should not normally fall below 5 to 8 litres per second, per occupant. When establishing a fresh-air supply rate, consider the following factors:
 - the floor area per person
 - the processes and equipment involved
 - whether the work is strenuous
- 58) Some ventilation systems are water based. Any water system where water is used or stored, and where there is a means of creating and transmitting water droplets that may be inhaled, can create a foreseeable risk of exposure to legionella. Guidance on the necessary measures to prevent or adequately control this risk is available on the HSE website (www.hse.gov.uk/legionnaires/), in the relevant ACOP and also from CIBSE.

COSHH

The Control of Substances Hazardous to Health Regulations 1991 (COSHH) regulations 6,7 and 8 require that you undertake a risk assessment and prevent or control the exposure of your employees to substances hazardous to health by using suitable control measures which includes general ventilation. Maintenance, examination and testing of the control measures (for example general ventilation to meet the requirements of regulation 7 are covered by regulation 9.

Standards & Guidelines

British Standard EN15780: 2011: Ventilation for buildings - Ductwork - Cleanliness of ventilation systems

- Sets out standards on surface cleanliness, testing and standards of cleanliness to be achieved in various quality classes and for new, used and cleaned ductwork.
- Suggests typical applications of Cleanliness Quality Classes. Describes various testing methods, including the Preferred Vacuum Test to measure dirtiness and cleanliness of ductwork of various types and functions, and in various classes.

These standards have been incorporated with the Building Engineering Services Association (BESA) TR19.

BESA - Guide to Good Practice TR19: Internal Cleanliness of Ventilation Systems (2nd edition 2013)

This guide incorporates the combination of the original TR17 guidance and DW/TM2 – Guide to Good Practice, Cleanliness of New Ductwork Installation and is widely recognised as an Industry Guide for Internal Cleanliness of New, Upgrade and Maintenance of ventilation systems and can be of direct benefit to the Designers, Installers, Facility Managers and the Users of the indoor environment. It sets out from design to delivery, storage, installation and onwards, the best practice methods to ensure the cleanliness of a ventilation system. The TR19 second edition (2013), whilst incorporating BS EN 15780, expands on the standard, together with benchmarks for acceptable surface contamination levels and recommended testing protocols.

The level of cleanliness can vary depending on the type and use of a building. For example: a basement store or warehouse will require a less rigorous standard than a high-quality office or hospital clinical area. To accommodate this variation in building type, a cleanliness quality classification has been defined as set out in Table 1 below supported by testing type benchmarks in TR19 Appendix F.

Cleanliness Quality Classes & Appendix F Quick Guide to Standards

System Quality Class	Typical Examples
Low	Rooms with only intermittent occupancy e.g. storage rooms, technical
Medium	Offices, hotels, restaurants, schools, theatres, residential homes, shopping areas, exhibition buildings, sports buildings, general areas in hospitals and general working areas in industries
High	Laboratories, treatment areas in hospitals and high-quality offices

Quick Guide Table: Air Ductwork Systems

The following table summarises the acceptable dust accumulation levels for various types of systems tested using the Preferred Vacuum Test (P.V.T.) method, defined and explained throughout this document. For details of the P.V.T. method and procedure please refer to the B&ES guidance note TR/19: Internal Cleanliness of Ventilation Systems. Appendix D

System Quality Class	Typical Example	Dust Accumulation Levels										Inspection and Testing Intervals				
		Newly Installed		Existing Ductwork				Post Clean Verification				AHU	Filters ³	Wet Areas ¹	Ducts	Terminals
		Acceptable Dust Accumulation Levels – Supply, Re-Circulation or Secondary Air Ductwork	Acceptable Dust Accumulation Levels – Extract Ductwork	Acceptable Dust Accumulation Levels – Supply Ductwork		Acceptable Dust Accumulation Levels – Re-Circulation or Secondary Air Ductwork		Acceptable Dust Accumulation Levels – Extract Ductwork ¹		Acceptable Dust Accumulation Levels – Supply, Re-Circulation or Secondary Air Ductwork	Acceptable Dust Accumulation Levels – Extract Ductwork					
D.T.T ⁵	P.V.T.	D.T.T ⁵	P.V.T.	D.T.T ⁵	P.V.T.	D.T.T ⁵	P.V.T.	D.T.T ⁵	P.V.T.							
Low	Rooms with only intermittent occupancy e.g. storage rooms	<0.9g/m ²	<1.8g/m ²	90µm	<4.5g/m ²	120µm	<6.0g/m ²	180µm	<9.0g/m ²	<0.3g/m ²	<0.3g/m ²	24	12	6	48	48
Medium	Offices, hotels, restaurants, schools, theatres, residential homes, shopping areas, exhibition buildings, sports buildings, general areas in hospitals and general working areas in industries	<0.6g/m ²	<1.8g/m ²	60µm	<3.0g/m ²	90µm	<4.5g/m ²	180µm	<9.0g/m ²	<0.3g/m ²	<0.3g/m ²	12	12	6	24	24
High	Laboratories, treatment areas in hospitals and high-quality offices	<0.3g/m ²	<0.9g/m ²	12µm	<0.6g/m ²	60µm	<3.0g/m ²	180µm	<9.0g/m ²	<0.3g/m ²	<0.3g/m ²	12	6	6	12	12

¹ Wet areas of the ventilation systems comprise humidification, cooling coils, condensate trays and other ancillary or associated items of plant containing these elements

² Extract systems should be cleaned when airflow through the system reduces by 15% or more. If such measurement is not practical, then the gravimetric dust level above may be used

³ Filters should be inspected and maintained according to the manufacturers recommendations with these intervals as the minimum

⁴ For compliance with HTM03 this frequency should be increased to 24 monthly

⁵ D.T.T. levels have been aligned with the British Standard to accommodate various system quality classes

Health Technical Memorandum (HTM) 03-01: Specialised ventilation for healthcare premises. Part B: Operational management and performance verification (2007)

The document gives comprehensive advice and guidance to healthcare management, design engineers, estates managers and operations managers on the legal requirements, design implications, maintenance, and operation of specialised ventilation in all types of healthcare premises.

Frequency of inspections and verifications

- 1.28. All ventilation systems should be subject to, at least, a simple visual inspection annually.
- 1.29. Ventilation systems serving critical care areas should be inspected quarterly and their performance measured and verified annually. The quarterly inspection should be a simple visual check; the annual verification will be a more detailed inspection of the system together with the measurement of its actual performance.
- 1.30. The LEV section of the COSHH regulations contains a statutory requirement that systems installed to contain or control hazardous substances be examined and tested at least every 14 months by a competent person.
- 1.31. Regular tests, at intervals agreed with the local fire prevention officer, will need to be carried out in order to demonstrate the continuing efficiency of the fire detection and containment systems. These may be in addition to the inspections detailed above. Records of these tests should be kept.

Ventilation System Cleaning

Various detailed advice is given, critically:

- 5.21. Supply air distribution ductwork conveys air that has been filtered. It will require internal cleaning only when it becomes contaminated with visible dirt. The frequency of cleaning will depend on the age of the system and grade of the AHU final filter but will typically be in excess of ten years. There is no requirement to clean ductwork annually.

A rapid build-up of visible dirt within a supply duct is an indication of a failure of the filtration or its housing

Acknowledgements

- The BESA TR/19 Guide to Good Practice: Internal Cleanliness of Ventilation Systems (2013)
- CIBSE TM26:2000 Hygienic Maintenance of Office Ventilation Ductwork.
- The Workplace (Health, Safety and Welfare) Regulations 1992 & ACOP.

Other Legislation, Standards & Guidance

- Health and Safety at Work Act 1974.
- The Control of Substances Hazardous to Health (COSHH).
- The Occupiers' Liability Act 1984.
- The Regulatory Reform (Fire Safety) Order 2005
- The Fire Safety (Scotland) Regulations 2006
- The Fire Safety Regulations (Northern Ireland) 2010.
- Legionnaires Disease –The HSE Approved Code of Practice L8.
- The Management of Health & Safety at Work Regulations 1999, Regulation 3.
- CIBSE: Healthy Workplaces GN2: Complying with the 1992 Health and Safety Regulations
- CIBSE: TM40 Health and Wellbeing in Building Services 2020
- BESA: SFG20 Standard Maintenance Specification for Building Engineering Services

Section 4: Summary Of Findings & Recommendations

A variety of system ages, designs and levels of maintenance are present amongst the systems inspected. It follows that a variety of system hygiene conditions exist, which call for various remedies which we list below.

All recommendations are made on the basis of comparison with good practice standards and an assessment of the vulnerabilities of served areas. All systems have been deemed as Medium Quality Class and on quantitative assessment based of surface deposit thickness test levels and for a qualitative assessment based on surface microbial activity using dip slides to determine total viable count of bacteria (TVC) and fungi.

Summary of Findings

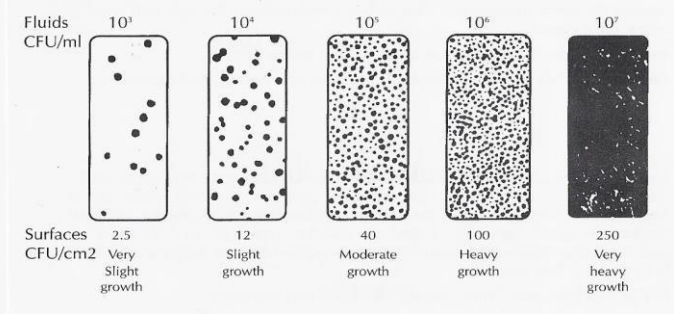
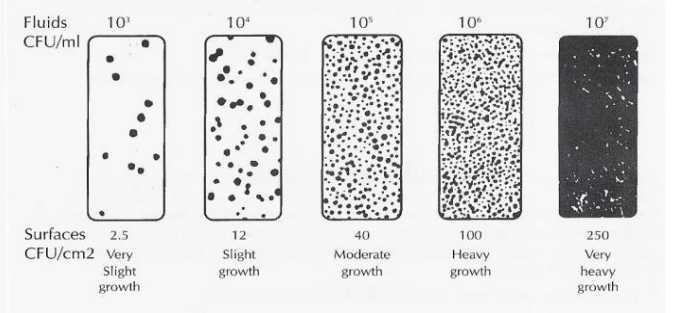
System Quality Class	Existing Ductwork – Acceptable Dust Accumulation Levels		
	Supply System	Re-Circulation System	Extract System
Low	90µm	120µm	180µm
Medium	60µm	90µm	180µm
High	12µm	60µm	180µm

Based on the above benchmarks the following table summarises the visual assessment and or test results to an acceptable level of ventilation hygiene risk, component condition comment and recommended action level.

Location	System Type	Surface Deposits	Microbial Activity	Action
Building A	Supply	Acceptable	Unacceptable	Clean System
Building B	Extract	Unacceptable	Not Applicable	Clean System
Building C	Supply	Acceptable	Acceptable	Continue Monitoring

Ventilation Hygiene Inspection/Test Assessment

The following show, by accessible inspection points, the visual assessment, surface deposit levels and microbial activity.

Test		Ventilation Hygiene Assessment
Methods	Deposit Thickness Test	Dust Deposit Thickness (DTT) is measured using an Elcometer 456 electromagnetic induction gauge, generally according to BESA TR19 protocol, taking 20 measurement locations via a standard 250x160mm template. *Asterisk-marked results were taken without the standard template and with less than standard number of locations where insufficient sampling area was available. All systems were treated as being Medium Quality Class (some exceptions discussed in the report)
	Wet Film Thickness Test	In locations where, the substrate was curved, or where insufficient space was available for the DTT probe, an Elcometer 112 Wet Film Thickness gauge was used. This gauge measures in increments of 25µm (25-300µm), 50µm (300-900µm), & larger up to 3000µm. Results are reported as between the lowest tooth position touching and the next highest.
	Microbiological Hygiene	Microbiological surface hygiene was assessed using Dimanco paddle-type dipslide samplers. The samplers comprise Tryptone Soy Agar (TTC) and Rose Bengal slides and were incubated at 30°C for 48 hours before enumeration using manufacturers' standard protocol, as below: Bacteria  Yeast, Moulds & Fungus 
	Visual	The majority of assessment was visual and recorded by camera, using extension devices where feasible. In addition, lower quality endoscopic images were also captured where necessary and feasible
	Notes	At each sampling location the best possible measurement/sampling method was used, taking account of site and job-brief limitations. Recommendations are made based on reference to 1) standards, 2) simple visual assessment & 3) an assessment of the vulnerability of the systems and occupied areas/occupants to contamination. Where a recommendation is marginal, or e.g. it is expected that action should be taken within a short time, then the recommendation is prefaced M (marginal)

Section 5: Assessment

No	Location	Sampling Site	Dust Deposit μm	Bacteria CFU/cm ²	Fungi CFU/cm ²	Comment / Risk	Photo / Time	Action

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Ventilation Hygiene Risk
Assessment Report

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Ventilation Hygiene Risk
Assessment Report

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