

Cleanliness of ventilation systems a REHVA guidebook

Pertti Pasanen
University of Kuopio, Department of Environmental Science
Finland
pertti.pasanen@uku.fi

Work group

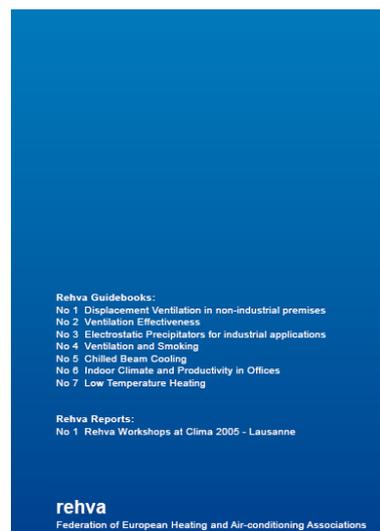
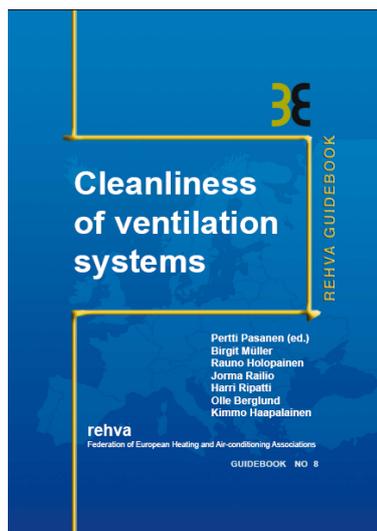
Birgit Müller, Rauno Holopainen,
Jorma Railio, Harri Ripatti,
Olle Berglund, Kimmo Haapalainen



UNIVERSITY OF KUOPIO

Health, environment, wellbeing

REHVA guidebook no 8



Aim and scope

To gather information on international criteria for cleanliness in ventilation systems and the methods for implementation of cleanliness

- to document the most important criteria for the cleanliness of air handling equipment and system
- to guide to proper design of clean ventilation system
- to guide to proper installation of clean ventilation systems
- to guide to the evaluation methods of cleanliness
- to guide to the efficient cleaning methods
- to guide to verification of cleanliness and maintenance practices
- to guide to available training practices

REHVA guidebook is focused in cleanliness control in **new installations** as well as in **existing systems**



Contents of the book

- CLEAN VENTILATION SYSTEM IN A NUTSHELL
- DEFINITIONS AND SYMBOLS
- INTRODUCTION

- CLEANLINESS CRITERIA FOR VENTILATION SYSTEMS
- DESIGN PRINCIPLES OF A CLEAN VENTILATION SYSTEM
- INSTALLING A CLEAN VENTILATION SYSTEM
- VERIFICATION OF THE CLEANLINESS OF VENTILATION SYSTEMS
- CLEANING OF A VENTILATION SYSTEM
- TRAINING PRACTICES
- REPORT AND DOCUMENTATION

- REFERENCES
- APPENDIXES



Cleanliness criteria

for ventilation systems

- Cleanliness criteria in various countries
 - requirements
 - European (EN12097), national
 - e.g. building code in Finland
 - voluntary guidelines
 - national (associations), (e.g. ISIAQ chapters)



Cleanliness criteria

for ventilation systems

- The major contaminants to avoid (in New system)
- Criteria for components (in the existing systems)
 - filters
 - coils
 - humidifiers
 - cooling tower
- Criteria for dust deposits in the system
 - existing systems (maintenance)
 - new systems (commissioning)



Design principles

of a clean ventilation system

The goal of design is to design high IAQ, the other things are involved in it

- Design
 - **Setting the IAQ target values** in conceptual design process with **user, architect and mechanical engineer**
 - **Design** phase mechanical designer designs the clean HVAC system according to specifications and gives the instruction of the methods in **aiming to clean HVAC system**



Design principles

of a clean ventilation system

The goal of design is to design high IAQ, the other things are involved in it

- Critical design features:
 - **placing** of fresh air intake, and exhaust, mechanical room, selection of components
 - **dimensioning**; air velocities in air grilles and louvres, cooling coils, heat exchanges, high efficiency filtration (2 steps),
 - sound attenuators, selection of materials (low fibre release)
- Installation with “low dust” clean technique, protection of open ends
- Contract document
- **Good documentation and instructions for maintenance of cleanliness**



Design principles of a clean ventilation system

- design and maintenance aspects
 - cleanability
 - openings
 - space
 - dimensions
- Referred main documents
 - EN 12097, EN 13053, EN 13779
 - FiSIAQ 2001, D2, VDI 6022



Installing a clean ventilation system

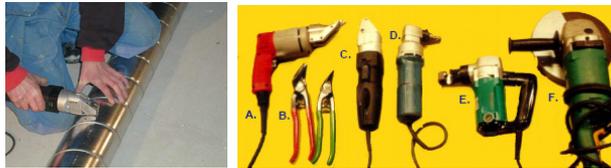
- protecting against impurities
 - continually all the building processes
 - storage



Installing

a clean ventilation system

- protecting against impurities
 - continually all the building processes
 - installation work (**cutting the ducts**, closing the open ending)
 - timing the working processes: cleaning of the system shall not be done before all construction work is completed



Installing

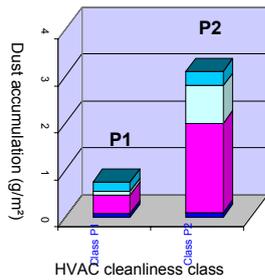
a clean ventilation system

- levels of cleanliness
 - basic
 - demands for manufactured products
 - delivery; not specially protected
 - checking of the cleanliness before installation; debris free
 - not special requirements for covering
 - intermediate
 - storage area should be clean and dry
 - component should be covered during installation
 - advanced
 - ducts and components should be capped or protected in all phases of construction, including transportation and storage

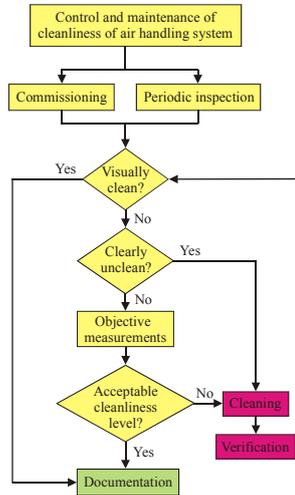


Verification of the cleanliness of ventilation system

- Evaluation methods
 - visual inspection
 - aided with visual scale
 - recommended as a basic method

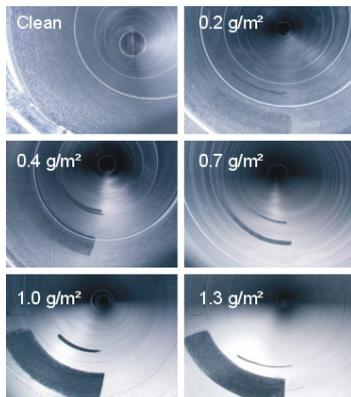


- After the building is finished
- After installation of vents
- After installation of main ducts
- Factory

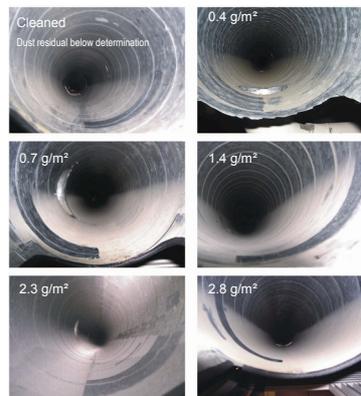


A set of pictures in newly installed and existing air ducts

Scale for new



Scale for existing



Verification

of the cleanliness of ventilation system

HOW

- methods for solid deposits
 - **sampling on filter with vacuum pump**
 - wiping with cloth (with solvent)
 - wiping with cloth (without solvent)
 - tape method
 - vacuum test (NADGA)

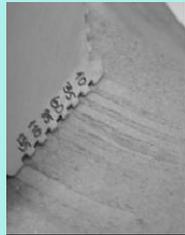


Figure 1



Figure 2



Figure 3

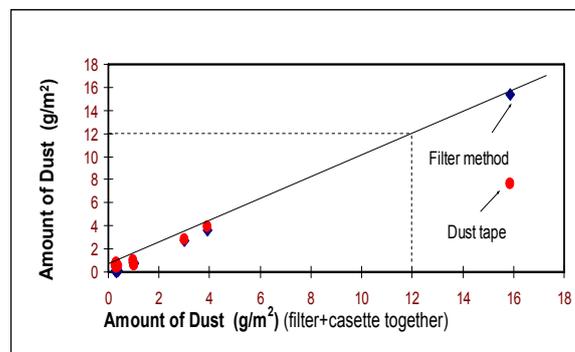
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Verification

of the cleanliness of ventilation system

HOW

- methods for solid deposits
- comparison of methods for solid deposits



Verification

of the cleanliness of ventilation system

WHAT

- microbial contaminants
 - surfaces
 - water systems
- airborne particles
 - mass and number
- fibres
 - surfaces, air
- oil residues
 - Surface (mainly for uninstalled components)



Cleaning

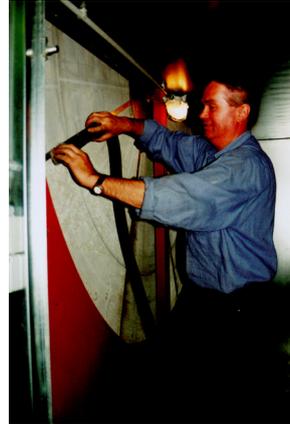
of a ventilation system

- Cleaning methods
 - dry cleaning methods
 - mechanical brushing
 - compressed air
 - hand vacuuming
 - wet cleaning methods
 - hand washing
 - steam washing
 - mechanical power washing
 - use of detergents



Cleaning of a ventilation system

- Instructions for **selection of cleaning** methods
 - air intake unit
 - filter chambers and fan
 - heat exchangers and coils
 - humidifiers
 - porous components
 - sound attenuators
 - surfaces of thermal insulations
 - terminal devices
- Disinfection (when and how?)
 - ductwork
 - humidifiers



Training practices

- training practices described in different codes
 - EVHA training standard
 - VDI 6022 training standard
 - Swedish training standard
 - NADGA training standard



Report and documentation

- Inspection and cleaning work shall be well documented
 - recommendations for detailed information of the contents of the document
 - descriptions of system
 - descriptions of methods used
 - visual information, proofs (photos)
 - conclusions
 - recommendations for building owner and management personnel



Relationships between the guidebooks and standards

- REHVA guidebook is not an official guideline or regulation, but it recommends the best proven practices for maintaining hygienic and clean ventilation systems
 - National regulations with more stringent values should always be followed
 - The guidebook is useful for practitioners who like to follow the recent international practices
- Standard EN 12097 gives requirements for ductwork design and construction in order to ensure the cleanability of the system, focusing on the size and location of access openings
- “Hygiene requirements for ventilation and air conditioning systems and units” (REHVA Guidebook no 9) goes in more detail to hygiene and health issues of the systems and components
- “EVHA Guide to cleaning and hygiene management of ventilation systems” and “EVHA Good practice document for grease extract cleaning” are targeted to cleaners

