

# **Regulations/guidelines to maintain cleanliness of air handling systems**

**Kimmo Haapalainen**

Vice President, Sales&Marketing

Tel: +358 50 3815000

[kimmo.haapalainen@lifa.net](mailto:kimmo.haapalainen@lifa.net)

# History of regulations/guidelines to maintain cleanliness of air handling systems

- National regulations and guidelines give
  - **regular time periods to inspect cleanliness** of HVAC system (Sweden SNBH 1994, Germany VDI 1998, USA NADCA 2001, Finland FiSIAQ 2001),
  - **limit value for dust accumulation** (SNBH 1994, HVCA 1998, FiSIAQ 2001, VDI 2002, EVHA2006a),
  - Both regular time periods to inspect and limit values for both dust *and microbes* (UNE 100012 Spain 2008),
  - **regular time periods to clean** HVAC system (HVCA 1998 grease only, MI of Finland 2001),
  - **Ministry of the Interior (Finland): decree on the cleaning of ventilation ducts and equipment + target values for ambient air, HVAC components and dust/fiber accumulation**

# Finland law on the cleaning of ventilation ducts and equipment (1997/2001)

to be cleaned once a year:

- 1) commercial food preparation premises;
- 2) spray-coating areas, woodwork factories and workshops, textile factories, laundromats, bakeries and fuming areas, industrial and other areas that collect large quantities of fire-spreading substances;
- 3) rooms in which inflammable liquids are industrially produced or technically used.

# Finland law on the cleaning of ventilation ducts and equipment

to be cleaned once in five years:

- 1) hospitals, pensioners' homes and restricted-access penal facilities;
- 2) day care centres, schools, hotels, holiday lodgings, boarding houses and restaurants.

TARGET VALUES FOR AIR QUALITY AND BUILDING COMPONENTS IN LAST SLIDES

# European Ventilation Hygiene Association (EVHA [www.evha.com](http://www.evha.com)) guidelines

- Limit value for **grease ducts**, measured by wet film thickness gauge ("grease comb") in microns:

Readings	Description	Action
(a) Micron readings between 0 - 50	Clean	Report
(b) Micron readings between 50 - 200	Acceptable	Monitoring scheduled
(c) Micron readings between 200 - 300	Dirty	Program cleaning
(d) Micron readings between 300 - 600	Heavy	Urgent cleaning
(e) Micron readings 600 +	Extremely Heavy	ASAP closure of system

- Limit values for **dry dust** in old air **ducts**, both supply (0,5-3 g/m<sup>2</sup>) and exhaust (3-5 g/m<sup>2</sup>) air ducts; trigger level and measuring method to be agreed between contractors

# FEDERATION OF EUROPEAN HEATING AND AIR-CONDITIONING ASSOCIATIONS

"REHVA" [www.rehva.eu](http://www.rehva.eu)

Guidebook no 8 (published 2006) "*Cleanliness of ventilation systems*" gives:

- Limit values for newly installed air ducts only
- Design and construction principles of installing a clean HVAC system
- Criteria for microbial cleanliness (legionella etc.) in existing systems in "Hygiene requirement for ventilation and air-conditioning" (according to VDI 6022; Spain has set similar figures)



# EN 16798-3:2017 Outdoor air (ODA) vs indoor air (IDA) – old European Standard EN 13779:2007

## Concentration levels of outdoor air

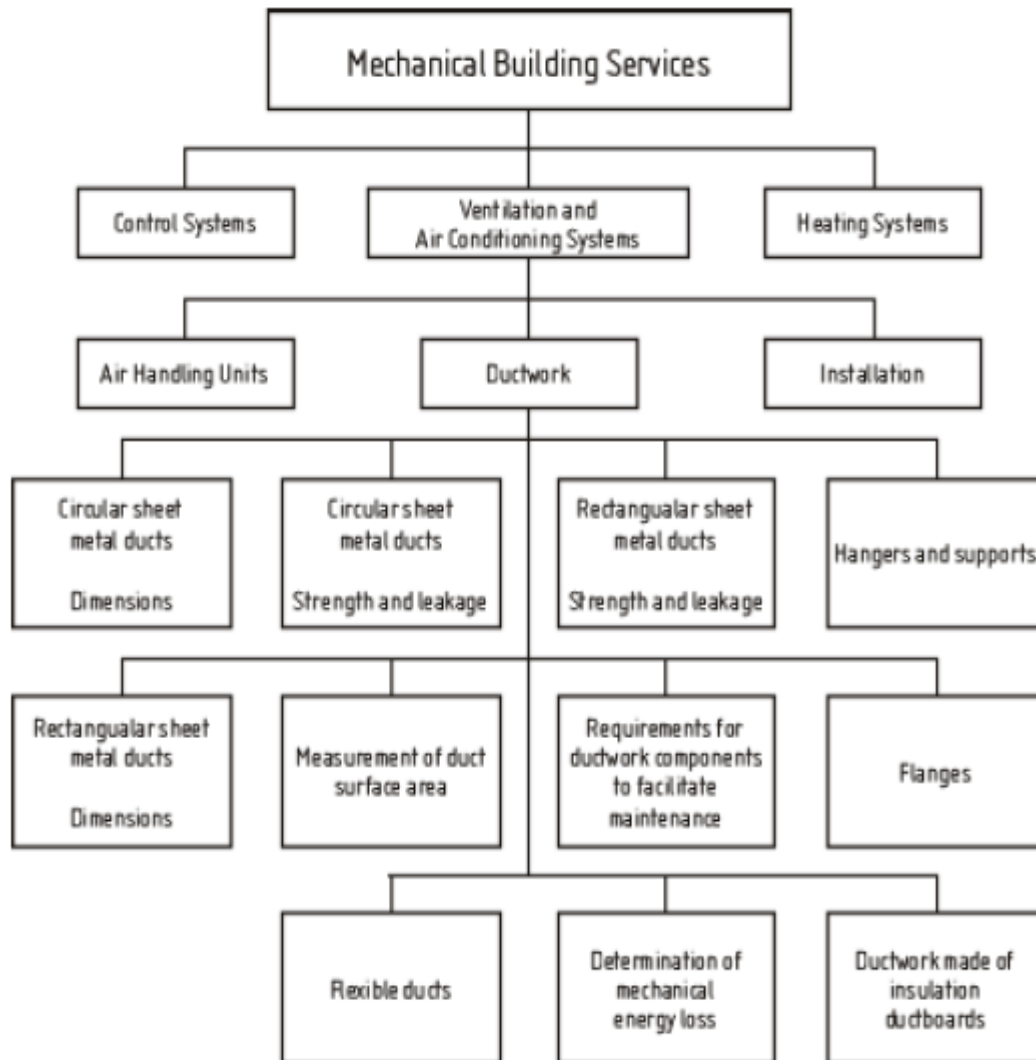
<i>Description of air quality</i>	<i>Concentration levels*</i>					<i>Category of outdoor air</i>
	CO <sub>2</sub> (ppm)	CO (mg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )	
<i>Rural areas with no significant sources</i>	350	<1	5-35	<5	<20	ODA 1
<i>Smaller towns</i>	400	1-3	15-40	5-15	10-30	ODA2/3
<i>City centres</i>	450	2-6	30-80	10-50	20-50	ODA 4/5

Reference air:

<i>Category</i>	<i>Description</i>	<i>CO<sub>2</sub>-level above level of outdoor air (ppm) Typical range</i>	<i>Rate of outdoor air (m<sup>3</sup>/h/person) Typical range, non-smoking area</i>
IDA 1	High IAQ	≤ 400	> 54
IDA 2	Medium IAQ	400 – 600	36 – 54
IDA 3	Moderate IAQ	600 – 1000	22 – 36
IDA 4	Low IAQ	> 1000	< 22

# European Standard EN 12079

The position of this standard in the field of mechanical services is shown in Figure N° 1.



Ventilation for Buildings –  
Ductwork –  
**Requirements for ductwork components to facilitate maintenance of ductwork systems**



# European Standards EN 15239 +15240, Inspection of ventilation systems and air handling units (AHU's)

- **MUST BE DONE ANNUALLY (since 2010)**
- EPBD directive "behind" = energy saving
- Scope for all systems (mechanical, natural, hybrid)
- Annexes contain practical examples
- Country specific guidelines how to implement
- **EN 15780 to define the cleanliness of existing ductwork also**

**EN 12599, Ventilation for buildings — Test procedures and measuring methods for handing over installed ventilation and air conditioning systems**

**EN 12792:2003, Ventilation for buildings — Symbols, terminology and graphical symbols**

**EN 14799:2007, Air filters for general air cleaning — Terminology**

**EN 16282 part 1-part 8 Equipment for commercial kitchen- components for ventilation in commercial kitchen**

# European Standard EN 15780: Cleanliness of ventilation systems

- EN 15780 (2011) defines the cleanliness of existing ductwork also – different dust accumulation levels (g/m<sup>2</sup>) for newly installed and existing ductwork, before and after cleaning
- Scope for all systems (mechanical, natural, hybrid) AND 3 different building types each have different levels
- Supply air levels lower than re-circulation/extract
- Annexes contain practical examples

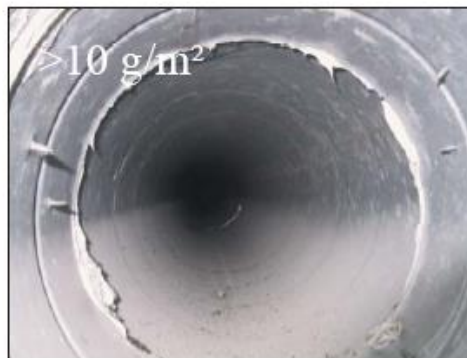
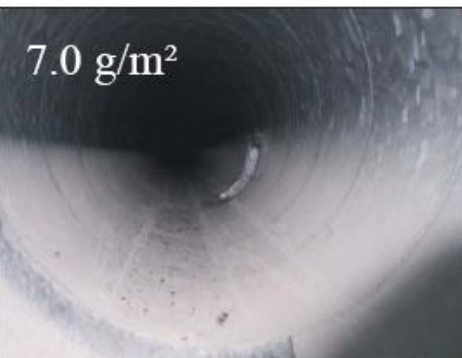
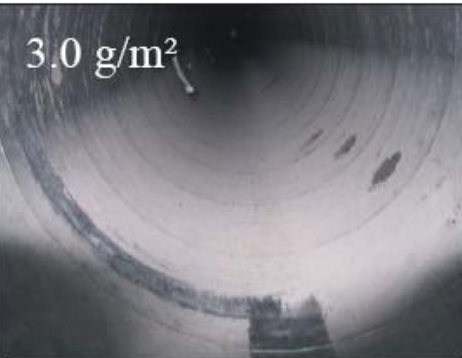
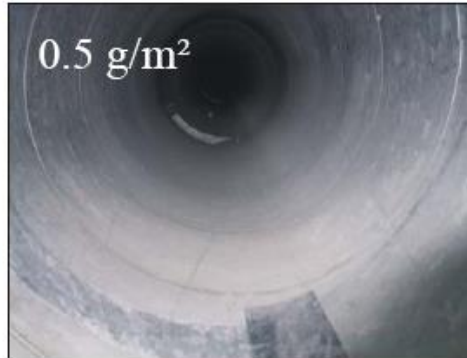
# EN 15780: Pre-clean evaluation

<b>Cleanliness Quality Class</b>	<b>Acceptable cleanliness level Supply Ductwork</b>	<b>Acceptable cleanliness level Recirculation or secondary air ductwork</b>
<i>Low</i>	$<4.5 \text{ g/m}^2$	$<6.0 \text{ g/m}^2$
<i>Medium</i>	$<3.0 \text{ g/m}^2$	$<4.5 \text{ g/m}^2$
<i>High</i>	$<0.6 \text{ g/m}^2$	$<3.0 \text{ g/m}^2$

## NOTES:

- **Extract air volume capacity should never be reduced more than 15%**
- Industrial manufacturing plants have own criteria for supply and exhaust air quality and/or volumes; regular checks ensure functioning and fire safety until next shut-down during which maintenance is carried out
- Kitchen extract (fire safety main issue + separate guidelines existing by EVHA)

# EN 15780: Visual inspection main method (+vacuum test if needed)



- 1) Pre-clean evaluation (assessment against the trigger levels of EN15780 )
- 2) During cleaning on-going assessment
- 3) Post-cleaning validation (verification against <0,3 g/m<sup>2</sup> trigger level (=3mg/100cm<sup>2</sup>))

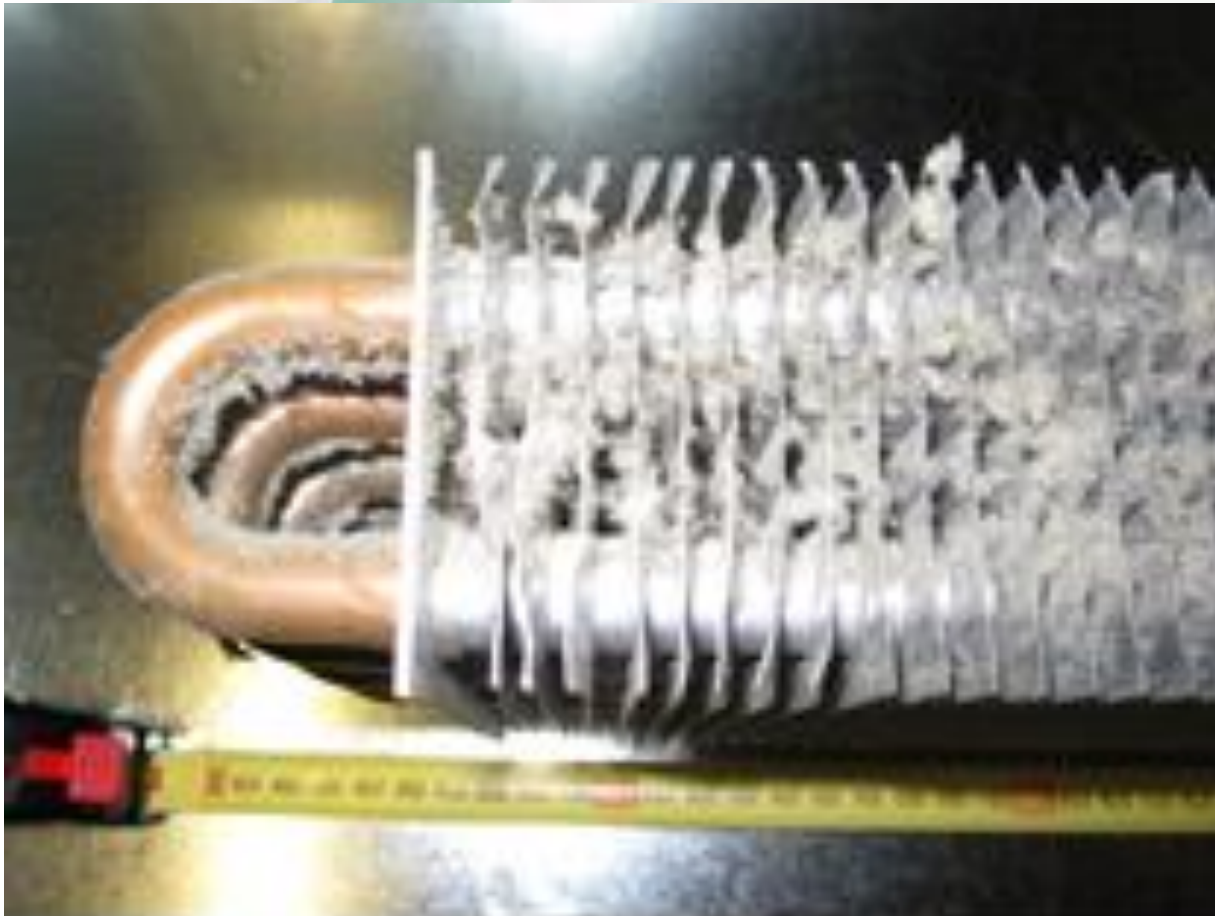


# ? Future needs = how to estimate life-cycle and impacts of new products in real environments

Photo from hospital intensive care room (been "cleaned" every 6 months **from outside**) – totally infected with all kinds of microbes

**1) Cooling beams and heat/cold recovery units inside buildings (and outside in different climates)**

**2) Heat pumps + other pipes "buried" underground**



# F7 bag filters ISO 16890:2017 - Air filters for general ventilation:

New international standard combines ASHRAE 52.2 which is dominant in USA and **EN779:2012** which is dominant in Europe. Both standards coexist in Asia and the Middle East.

The test method of ISO 16890 is for particulate sizes ePM<sub>1</sub>, ePM<sub>2,5</sub> and ePM<sub>10</sub> and applicable for air flow rates between 0,25 m<sup>3</sup>/s (900 m<sup>3</sup>/h, 530 ft<sup>3</sup>/min) and 1,5 m<sup>3</sup>/s (5 400 m<sup>3</sup>/h, 3 178 ft<sup>3</sup>/min), referring to a test rig with a nominal face area of 610 mm × 610 mm (24 inch × 24 inch).

In practice, the filter test is performed in five steps:

- 1) Efficiency and pressure drop measurement (of a clean filter)
- 2) Discharging conditioning (isopropanol aerosol “wetting”)
- 3) Post-discharging efficiency measurement
- 4) Dust holding and arrestance measurements (dust particles PM<sub>1</sub>, PM<sub>2,5</sub> and PM<sub>10</sub>)
- 5) Calculation and ePM classification



# bag filters ISO 16890:2017 - Air filters for general ventilation:

## Group classification according ISO16890

ISO ePM1	ePM1,min $\geq$ 50% (viruses, nanoparticles, exhaust gasses)
ISO ePM2.5	ePM2.5,min $\geq$ 50% (bacteria, fungal and mold spores, pollen, toner dust)
ISO ePM10	ePM10 $\geq$ 50% (pollen, desert dust)
ISO coarse	ePM10 $\leq$ 50% (sand, hair)

## Comparison to old EN:779 below

Class	ISO ePM1	ISO ePM2.5	ISO ePM10	ISO Coarse
G3	-	-	-	> 80
G4	-	-	-	> 90%
M5	-	-	> 50%	-
M6	-	50 - 65%	> 60%	-
F7	50 - 65 %	65 - 80%	> 85%	-
F8	65 - 80 %	> 80 %	> 90%	-
F9	> 80 %	> 95 %	> 95%	-

\* All figures, descriptions, references and technical data contained in this text are given as mere example and are not binding.

# Kitchen grease exhaust cleaning standard – current developments

**Regulations/guidelines to maintain  
cleanliness of air handling systems**

**THANK YOU!**

**Kimmo Haapalainen**

Vice President, Sales&Marketing

Tel: +358 50 3815000

[kimmo.haapalainen@lifa.net](mailto:kimmo.haapalainen@lifa.net)