DUCTWORK AIRTIGHTNESS IN FRENCH REGULATION AND FD E51-767

TIGHT VENT – AIVC – APRIL 2019

OUTLINE

- **DUCTWORK AIRTIGHTNESS IN FRENCH REGULATION**
- **LEAKAGES – EXAMPLE OF A EP CALCULATION**
- **FD E51–767 DUCTWORK TIGHTNESS MEASUREMENTS**

Ductwork Airtightness in French Regulation

In new buildings, the ductwork class is an input data in the Energy Performance calculation (RT2012 : EP Regulation)

→ No minimum requirement

→ Impact on heating loads / cooling loads

If a better value than the default value is used in the EP calculation :

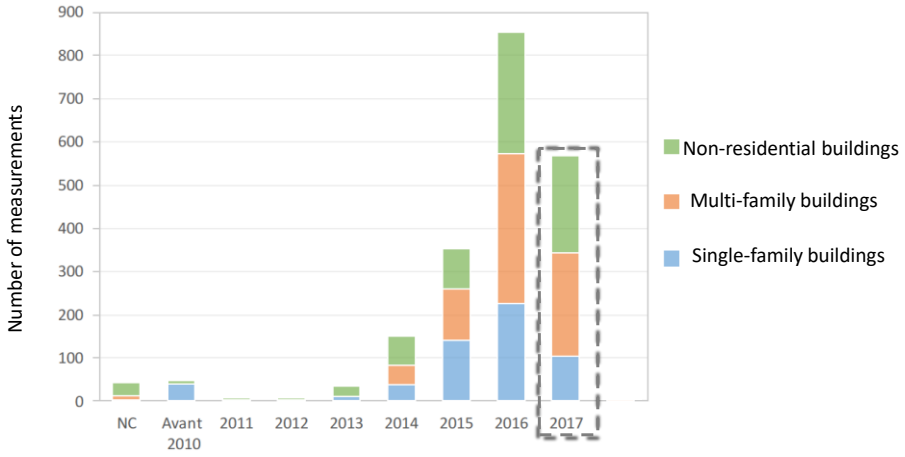
→ a measurement is required to justify Class A, B or C

→ this measurement has to be performed by a qualified idependant technician

Since 2013, Effinergie + label requires Class A

Database overview

Evolution of the number of measurements



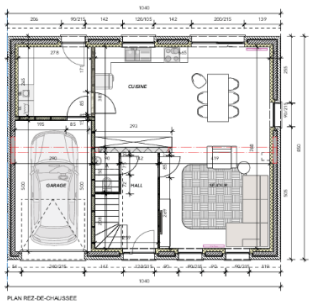
Source – CEREMA Database of ductwork airtightness measurements in France

DUCTWORK LEAKAGES

EXAMPLE OF A EP CALCULATION

Ductwork leakages
Example of a EP calculation

Single family house



CLIMATIC CONDITION :
- Zone H1a

FLOOR AREA :
- 98 m²

TOTAL LOSS AREA :
- 290 m²

Source – OCR (http://ocr-expertise.fr)

Ductwork leakages
Example of a EP calculation

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Characteristics of the house

	Parois	Libellé	Système constructif du bâti	Ep. isolant (cm)	R isolants m².K/W
Building enveloppe					
Ground floor	Plancher bas				
	Sur Vide-Sanitaire	Plancher hourdis isolant	ITR – Polystyrène	-	Up = 0.27
Roof	Plancher haut				
	Rampant	Isolant sous toiture + doublage intérieur	ITR – Laine minérale (λ = 0.040) ITI – Laine minérale (λ = 0.032)	20 + 6	6.9
External Wall	Paroi verticale				
	Mur extérieur	Doublage intérieur sur maçonnerie	ITI – laine minérale (λ = 0.032)	14	4.38
Windows	Paroi vitrée				
		Cadre	Vitrage	Uw (W/m².K)	
	Double vitrage - VR	PVC	4/16/4, PE Argon	1,5	
Technical equipements	Systèmes				
Heating system	Chauffage				
	Chaudière Gaz Condensation	Rdt : 97.8%	Puissance : 24 [kW]		
Hot water	Eau Chaude Sanitaire				
	Ballon thermodynamique – Air extérieur – 250L				
Lighting system	Éclairage				
	Puissance d'éclairage moyenne = 8 [W/m²]				
Ventilation system	Ventilation				
	…				

OCR Source – OCR (http://ocr-expertise.fr)

Ductwork leakages
Example of a EP calculation

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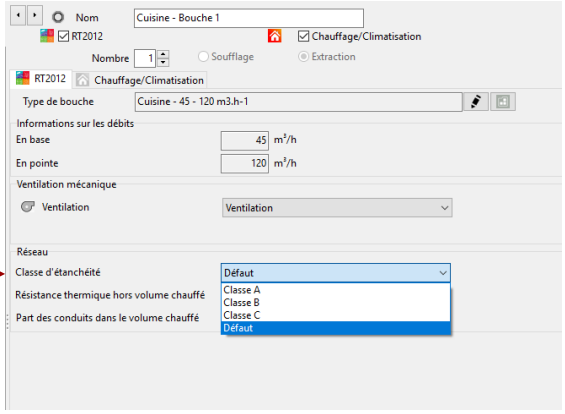
Ductwork airtightness is a input data in EP calculation

Ductwork airtightness class



OCR Source – OCR (http://ocr-expertise.fr)

Ductwork leakages
Example of a EP calculation

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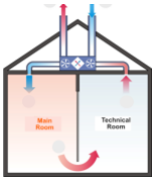
MVHR

- Nominal air Flow : 105 [m³/h] (max 180 [m³/h])
- Exchanger : 82% Heat Recovery Efficiency
- Supply Ductwork and Extract Ductwork :
  25% inside conditioned space
  75% outside conditioned space



Ductwork airtightness Class	Heating [kwhep/m²]	Energy saving	
		[kwhep/m²]	(%)
Default Value	30,6	0	-

Source – OCR (http://ocr-expertise.fr)

Ductwork leakages
Example of a EP calculation

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Ductwork airtightness Class
Default Value
A
B
C

→ Default value : No mandatory test

→ Class A, B or C : Mandatory test

The ductwork airtightness measurement has to be performed :

- ➢ by a qualified idependant technician

(About 100 certified testers according to a national qualification scheme for ductwork testers)

- ➢ according to the FD E51-767

FD E 51-767

Ventilation for buildings – Ductwork tightness measurements

FD E51-767

FD E51-767 -> National guidance to specify how to use test standards :

- On site with various kind of ductwork (different materials, different shapes, …)
- Different use of building (non residential building, residential building…)
- To take into account the usual operating pressure of the ventilation system
- How to sample
- How to take into account specific devices (plenum box, flexible sleeve, …)

FD E51-767

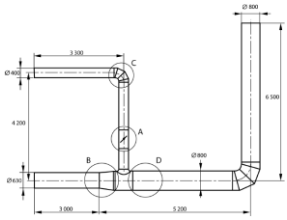
FD E51-767 refers to :

- EN 12 237 : Ventilation for buildings – Ductworks – Strength and leakage of circular sheet metal ducts
- EN 1507 : Ventilation for buildings – Sheet metal air ducts with rectangular section – Requirements for strength and leakage
- EN 13 403 : Ventilation for buildings – Non-metallic ducts – Ductwork made from insulation ductboards
- EN 12 599 : Ventilation for buildings – Test procedures and measurement methods to hand over air conditionning and ventilation systems

FD E51-767

Measurement of ductwork surface area :

- FD E51-767 refers to : EN 14 239 Ventilation for buildings — Ductwork — Measurement of ductwork surface area



Diamètre mm	Aire latérale du conduit [a] par unité de longueur m^2/m	Longueur m	Aire latérale totale du conduit m^2
800	2,51	6,5 + 5,2	2,51 × 11,7 = 29,4
630	1,98	3,0	1,98 × 3,0 = 5,9
400	1,26	4,2 + 3,3	1,26 × 7,5 = 9,5
Total pour l'installation représentée sur la Figure 2			44,8

- Only for individual system (in residential buildings) it's also possible to calculate the surface area with another method :

→ 0,1 x Floor area of the dwelling

FD E51-767

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Test pressure :

Type of ductwork :

- Supply air ducts : Positive pressure
- Exhaust air ducts : Negative pressure

Use of building :

Building	Test pressure
Residential Building – Single family houses	± 80 Pa
Residential Building – Multi family building	± 160 Pa
Non Residential Building	± 250 Pa
Non Residential Building if $\lvert P_{design} \rvert > \lvert$test pressure$\rvert$+50Pa	P_{design}

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How to sample :

- Individual system (residential)
  - 100 % of ductwork (Exhaust ductwork and Supply ductwork)

- Collective system (residential) and non residential system
  - All kinds of ducts (size, type of ducts, type of section, type of accessories, …)

AND

  - One of those requirements shall be met :
    - **Case 1 :** L/Aj ≥ 1 and Aj > 10 m2 and Aj > 10 %
    - **Case 2 :** At least one whole floor to the ventilation unit and Aj > 10 m2 and Aj > 20%
    - **Case 3 :** At least one whole column to the ventilation unit and Aj > 10 m2 and Aj > 20%

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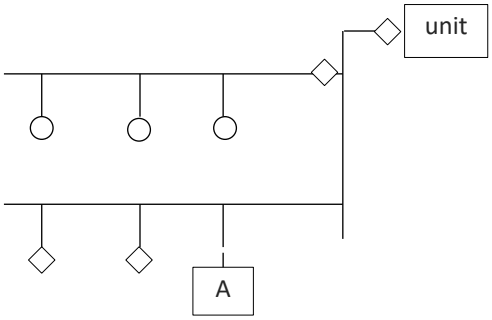
How to sample :

CASE 2 – example

A : equipment for measuring

◯ : exhaust or supply unit

◇ : sealed



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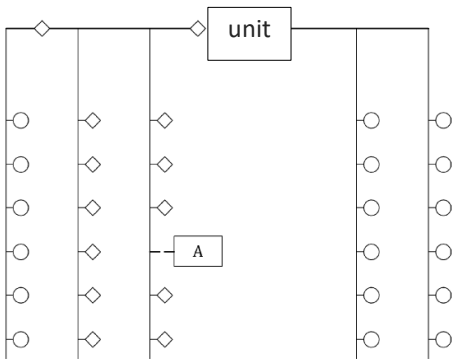
How to sample :

CASE 3 - example

A : equipment for measuring

◯ : exhaust or suppy unit

◇ : sealed



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How to sample :

If there are several ventilation units and air handling units

Method of sample selection :

- If N ≤ 5, each ductwork have to be tested
- If N > 5, number Of ductwork to be tested :

5 + 40% x (N-5)

N : number of unit

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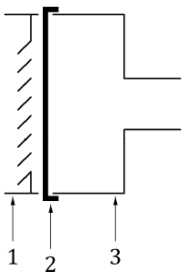
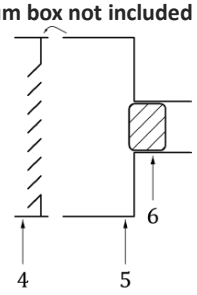
Measuring method – specific devices

- To Give penalties if some parts can't be tested to use it for the EP Calculation
- Method to seal off the diffuser (exhaust units / supply units) or the climate beams

Plenum box included



Plenum box not included



1 - 4 **Exhaust or supply unit or Climate beams**

2 **Sealing instead of unit**

3 – 5 **Plenum box**

6 **Sealing in the duct**

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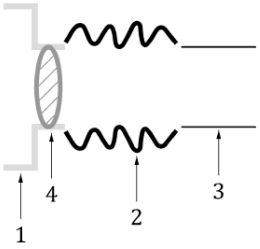
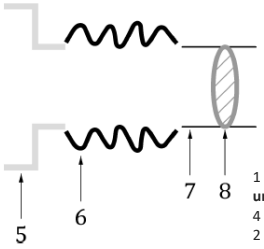
Measuring method – specific devices

Method to seal off the connection to the Ventilation unit

Flexible sleeve included



Flexible sleeve not included



1 – 5 **Ventilation unit (fan, air handling unit…)**
4 – **Sealing in the ventilation unit**
2 – 6 **Flexible sleeve - Connection Ductwork – Ventilation Unit**
3 – 7 **Ductwork**
8 **Sealing in the duct**

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Measuring method – specific devices

Method to seal off – Specific devices – Correction of measured values

Componant			Penalties Correction of measured values
Flexible sleeve	**Climat beam**	**Plenum box**	
Included	Included	Included	x 1
Not included	included	Included	x 1,3
Included	Not included	Included	
Included	Included	Not included	
Not included	Not included	Included	x 1,4
Included	Not included	Not included	
Not included	Included	Not included	
Not included	Not included	Not included	x 1,5

Thank you for your attention

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