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Building airtightnesses in the new French thermal regulation RT 2000

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SYNOPSIS

Ventilation plays an important role in the RT 2000 regulation. The ventilation system is of course taken into account, but also the building envelope airtigthness on which this paper focuses.

KEYWORDS

leakages, building airtightness, ventilation heat losses, ventilation codes,

INTRODUCTION

The ventilation part of the RT2000 is based on the use of an implicit model. A two step approach is used : the airflow entering and leaving the building are first calculated and in a second step, their energy impact.

The impact of building envelope aitightness depends on the airflow due to the ventilation system itself and boundary conditions (outdoor pressure and temperature, indoor temperature). An other point to be taken into account in the internal partition of the building enabling or not airflows from a facade to another one, or from one level to another.

As the ventilation system airflows varies with time, the calculation is done for each situation (for example in on residential building we distinguish the calculation during occupancy and non occupancy period)

1 INPUT DATAS

1.1 OUTDOOR CONDITIONS

For each month and each climatic zone (H1, H2, H3) from north to south the outdoor conditions are taken into account for each month through the average outdoor temperature, and 5 wind speeds corresponding to an occurrence of 20 %. This wind sppeds are calculated using the weiibull law (see example in table 1)

$prob(v_e) = 1 - \exp(-(v_e/A)^K)$

Zone H1												
Month	Jan	Feb	Marc	Aprl	May	June	Julyt	Oct	Sept	Oct	Nov	Dec
Te	3,5	4	7,1	10,5	13,1	16,3	20,6	18,9	16	10,6	4,8	3,7
A (m/s)	2,4	3,5	3,6	3,5	3,1	3,2	3,1	2,9	2,8	2,7	2	3
K	1,25	1,77	1,83	1,82	2,11	1,72	1,75	1,96	2	1,7	1,24	1,53
$V_{e.prob}$ (1)	0,47	0,98	1,00	0,99	1,04	0,86	0,87	0,90	0,91	0,75	0,38	0,72
$V_{e.prob}$ (2)	1,08	1,89	1,99	1,89	1,80	1,71	1,71	1,62	1,62	1,44	0,89	1,53
$V_{e.prob}$ (3)	1,69	2,69	2,78	2,69	2,42	2,42	2,42	2,24	2,24	2,06	1,43	2,24
$V_{e.prob}$ (4)	2,56	3,65	3,65	3,57	3,13	3,29	3,21	2,95	2,95	2,85	2,12	3,11
$V_{e.prob}$ (5)	4,28	5,18	5,18	5,03	4,21	4,80	4,57	4,07	3,97	4,13	3,60	4,73

Table 1 Example of conventional outdoor conditions

1.2 BUILDING ENVELOPPE DESCRIPTION

The building envelope is characterised by its Qv4Pa (air flow under 4 Pa) and the building height. As it is not possible to know the position of the leakages, default values depending on the facade orientation are taken into account

For building with possible cross ventilation, the leakages are considered to be split equally in the lower part and higher of the windward, side and leeward façade(for each position 1/6 of the overall Qv4Pa is then applied). For building without cross ventilation, we introduced two fictive façades (for ech up and down position, 1/4 of the Qv4Pa is then applied)

If no air flow can pass from one level to another one, The stack effect is calculated by replacing the building height by the level height.

The corresponding Cp values are described in the paper "Ventilation in the new French thermal regulation RT 2000".

For those who do not want to get engaged on a result (which means to be ready to verify the Qv4Pa on the building), default values can be used with the following values :

	Default value
Detached houses	1.3
Residential, office; schools	1.7
Industrial buildings, stores	3.0

Table 2 : values of Q4Pa ($m^3/(h.m^2$ of external envelope))

1.3 INDOOR AND VENTILATION SYSTEM DESCRIPTION

Internal temperature ix provided by the general C calculation method. Ventilation airflows are calculated separately as described in the above mentioned paper

1.4 OUTPUT DATAS

From each case (outdoor temperature and wind, indoor temperature, ventilation system airflows), the implicit method calculate the airflows due to infiltration and exfiltration by calculating the internal building pressure corresponding to the balance between air entering and leaving the building.

As the ventilation energy impact is based on the extract airflows, the exfiltration through the building envelope is the value used afterwards.