

ANNEX WP1.A.A

Notes: Mechanical load and French regulations

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In reference to the French regulation and the « Eurocode », we get the results below :

1.1 INTEGRATED COLLECTORS:

In this case the codes NV65 modified 99 and Eurocode can be used.

By using the NV65/99, the wind load could be calculated with the external pressure coefficient C_e .

Note :

The load on the glazing is: $F=S.C_e.q$

- S is the area of the glazing
- C_e is the external pressure coefficient
- q is the dynamic pressure of the wind.

C_e depends on many parameters for example: building geometry, roof slope, building orientation with respect to wind.

q depends of many parameters for example : building height, geographic zone, site exposure, ...

We also need to make a distinction between the common sections and the specific sections of the building where the collector could be installed, for example: roof edges, ridge, building angles...

In those cases one should adopt a local pressure coefficient $C=2C_e$

So it is not possible to give an ordeal pressure without giving a more detailed framework.

However, one can give some examples:

For an common building form with $\gamma_0=h/a$ close to 1 (this building type belongs to the general case with $0.5 < h/a < 2.5$ where h is the building height and a is the windward face length) and for a roof slope below 20° , the maximum value one can obtains is:

$$C_{e_{max}} = -0.7$$

For building height up to 10 meters located in exposed sites, one obtains:

For common sections

French zone 4: $0.7 \cdot 1575 \cdot 1.2 = 1350$ Pa

French zone 5 : $0.7 \cdot 2100 \cdot 1.2 = 1800$ Pa

For specific sections ($C=2 \cdot C_e$)

French zone 4 : 2700 Pa

French zone 5 : 3600 Pa

If the building is 20 meters high:

For common sections

French zone 4: 1600 Pa

French zone 5 : 2100 Pa

For specific sections ($C=2 \cdot C_e$)

French zone 4 : 3200 Pa

French zone 5 : 4200 Pa

1.2 STANDARD COLLECTORS:

In this configuration, the aerodynamic field of the building is the most important element to calculate pressure coefficients for collectors. French NV65/99 or Eurocode do not provide the relevant pressure coefficient values.

Wind tunnel tests done at CSTB in 1985 give estimations of the resulting loads (cahier du CSTB 2045 - livraison 265 Décembre 1985):

For an inclined collector (45°) on a flat roof of a 15 meter high building, located in coastal site, one can reach on common section 2700 Pa in zone 4 and 3400 Pa in zone 5 of the French code. One could reach 3500 Pa and 4400 Pa in specific section.

For an inclined collector (45°) on a 10 meters high house roof, located in coastal site, one can reach 2000 Pa in zone 4 and 2600 Pa in zone 5.