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Ventilation in residential buildings with individual stoves

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Heating stoves means that air volume required for combustion is taken away from the room where the stove is located. Fresh air supply passing the leakage formed by the building requires low pressure in the room the stove is located. This low pressure is generated by wind power and thermal upward pressure. When the fire is burning in the stove, mainly wind power is subject to considerable intensity variations. As a result, changes in the air supply required for combustion occur bringing about a lowering in the operational condition of the stove into noneconomic ranges (too much air supply for the combustion process) or into ranges causing damage to health (too little air supply for the combustion process).

In order to stabilize the operational condition of open stoves even under wind influence, the infiltration of the house may be influenced by distributing and characterizing the building's intake air resistances. These are window independent facilities for free ventilation (air intake components) which are required to be used in connection with the successive decrease of joint leakage of window structures, for hygienic and physical reasons, as well, and facilities allow a variable arrangement.

For a special multi-storeyed building with open stoves, the air flow distribution was determined by means of a multi-zone model under the following aspects:

- different wind direction and wind velocity
- different number and arrangement of intake air components in the building
- different resistance characteristics of the intake air components.

Results :

For dwellings which can be transversally ventilated, a rectangular inflow of those facades with usual leakages (such as windows, intake air components) results in an increase of the volume flow of the combustion air with increasing wind velocity. By the use of these intake air components, effecting a nearly constant volume flow irrespective of the differential pressure, this increase causing

non-economic combustion process may be lessened. It is recommended to make a uniform distribution of the intake air components on the building facade taking into account various wind directions.

Whereas the rectangular inflow of facades without usual common leakages (gable inflow of terraced houses) results in a decrease of combustion air supply at increasing wind velocity. In this case, the operational condition of the stove may only be stabilized by shifting the ratio between wind pressure and thermal upward pressure in favour of the upward pressure. This additional required upward pressure can be generated by an arrangement of the intake components in the system of infiltration of the building which is "low" with regard to the stove. However, generally critical operational conditions may not be avoided for the stove but they are only shifted into a range of higher wind velocities. In especially unfavourable cases, the proper use of the stove is only possible by extending the chimney.