



**element control
systems**
commercial louvres
& solar shading

NATURAL VENTILATION

commercial louvres | solar shading | design consultancy | sales and installation | natural ventilation

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PRINCIPLE OF OPERATION

The two forces affecting the extraction efficiency and therefore the design of a natural ventilation System thermal currents within the building, and the wind. Of these two, the thermal currents, which are created by the heat from plant or personnel, or by solar heat transferred through the structure, are the predictable factor.

The force provided by the wind is less predictable, with the possibility of no wind at all on some of the hottest days, when ventilation requirements are greatest.

Consequently, Element Control Systems Ventilation design has placed emphasis on the use of thermal currents. This is achieved by providing the largest possible exhaust opening in relation to the overall size of the ventilator.

Siting of exhaust openings in both the top and sides of the ventilator can also additionally ensure that resistance to upward air flow is reduced to a minimum. Although the ventilator is in no way dependant on wind power, wind will further increase the extraction rate of an engineered design.

BUOYANCY

Buoyancy ventilation may be temperature-induced (stack ventilation) this relies on the increased buoyancy of the humid air as it warms to exhaust air from the space through a stack. The cool air supply to the space is pressurized by weight of the column of cool air above it. Buoyancy results from the difference in air density. The density of air depends on temperature and humidity (cool air is heavier than warm air at the same humidity and dry air is heavier than humid

air at the same temperature. Within a Factory or commercial building, heat and humidity given off by occupants and other internal sources both tend to make air rise. The stale, heated air escapes from openings in the ceiling or roof and permits fresh air to enter lower openings to replace it. Stack effect ventilation is an especially effective strategy in the summer months, when indoor/outdoor temperature difference is at a maximum.



An expression for the airflow induced by the stack effect is:

Q **stackCd*A*[2gh(Ti-To)/Ti] ^ 1/2, where**

Q stack..... **volume of ventilation rate (m³/s)**

Cd **0.65, a discharge coefficient**

A..... **free area of inlet opening (m²), which equals area of outlet opening**

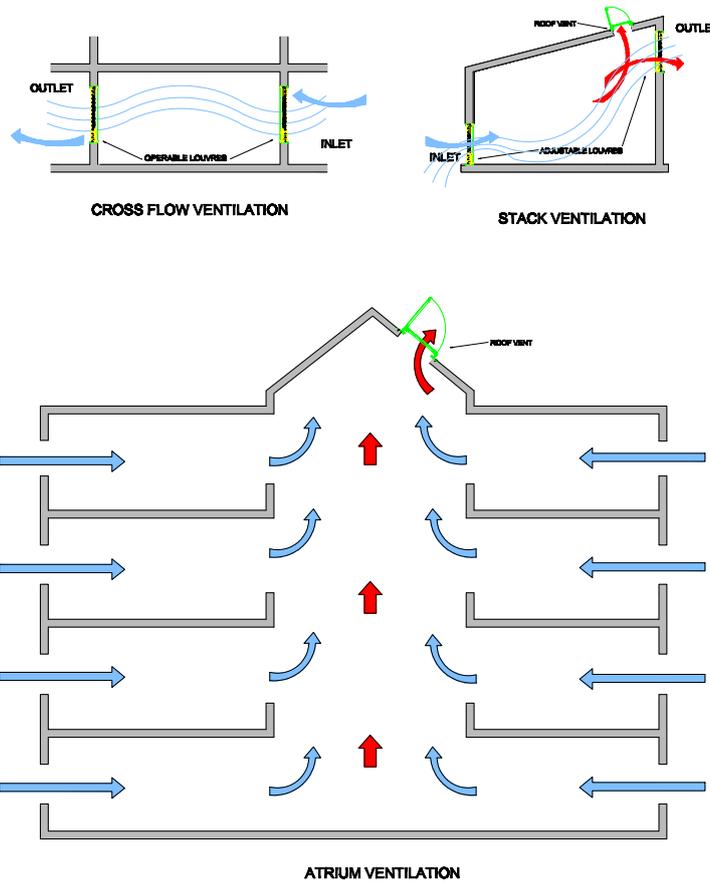
g **9.8 (m/s²). the acceleration due to gravity**

h..... **vertical distance between inlet and outlet midpoints (m)**

Ti **average temperature of indoor air (K)**

To **average temperature of outdoor air (K)**

TYPICAL NATURAL VENTILATION METHODS



BENEFITS

At a time when power costs are escalating and CO2 emissions need to be controlled why would we not consider the nature's way of ventilation with no cost whilst helping to preserve our environment.

Smart building design will also boost your employment productivity and save you money.

Human Productivity research by N.S Billington proved that productivity drops about 10% and the accident rate rises about

25% within every 5 degrees celcius above 25 degrees celcius. It is easy to calculate what a few days over 30 degree days and poor ventilation will do to your production.

Element Control Systems offer unique and engineered design solutions with series of operable and fixed ventilation products for roof and wall applications.

For further details including free design service please contact Element Control Systems

PRODUCTS

Element Control Systems offer the following .

Open Sky : High Efficient attractive Low profile louvred natural ventilator specifically designed for smoke and heat exhaust and natural ventilation applications .Can be roof or wall mounted for exhaust or air inlet .



Sky Vent: High quality single and twin flap ventilator designed for both smoke and natural ventilation requirements. Its low profile design offers the ideal solution for modern industrial and commercial buildings.



PGV : Glased vertical louvre ventilator used for both natural and smoke ventilation purposes It comes with either double glazing or insulated panels



AIR CHANGE RATES

Building / Room Air Change Rates -n- (1/hr)

All spaces in general	min 4
Attic spaces for cooling	12 - 15
Auditoriums	8 - 15
Bakeries	20
Banks	4 - 10
Barber Shops	6 - 10
Bars	20 - 30
Beauty Shops	6 - 10
Boiler rooms	15 - 20
Bowling Alleys	10 - 15
Cafeterias	12 - 15
Churches	8 - 15
Club rooms	12
Clubhouses	20 - 30
Cocktail Lounges	20 - 30
Computer Rooms	15 - 20
Court Houses	4 - 10
Dental Centers	8 - 12
Department Stores	6 - 10
Dining Halls	12 - 15
Dining rooms (restaurants)	12
Dress Shops	6 - 10
Drug Shops	6 - 10
Engine rooms	4 - 6
Factory buildings, ordinary	2 - 4
Factory buildings, fumes and moisture	10 - 15
Fire Stations	4 - 10
Foundries	15 - 20
Galvanizing plants	20 - 30
Garages repair	20 - 30
Garages storage	4 - 6
Homes, night cooling	10 - 18
Jewelry shops	6 - 10
Kitchens	15 - 60
Laundries	10 - 15

AIR CHANGE RATES

Building / Room Air Change Rates -n- (1/hr)

Libraries, public	4
Lunch Rooms	12 - 15
Luncheonettes	12 - 15
Nightclubs	20 - 30
Malls	6 - 10
Medical Centers	8 - 12
Medical Clinics	8 - 12
Medical Offices	8 - 12
Mills, paper	15 - 20
Mills, textile general buildings	4
Mills, textile dye houses	15 - 20
Municipal Buildings	4 - 10
Museums	12 - 15
Offices, public	3
Offices, private	4
Police Stations	4 - 10
Post Offices	4 - 10
Precision Manufacturing	10 - 50
Pump rooms	5
Restaurants	8 - 12
Retail	6 - 10
School Classrooms	4 - 12
Shoe Shops	6 - 10
Shopping Centers	6 - 10
Shops, machine	5
Shops, paint	15 - 20
Shops, woodworking	5
Substation, electric	5 - 10
Supermarkets	4 - 10
Town Halls	4 - 10
Taverns	20 - 30
Theaters	8 - 15
Turbine rooms, electric	5 - 10
Warehouses	2
Waiting rooms, public	4