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Control of Indoor Climate by an Integrated HVAC and Building System

Contrôle du climat intérieur par un système intégré de climatisation et construction

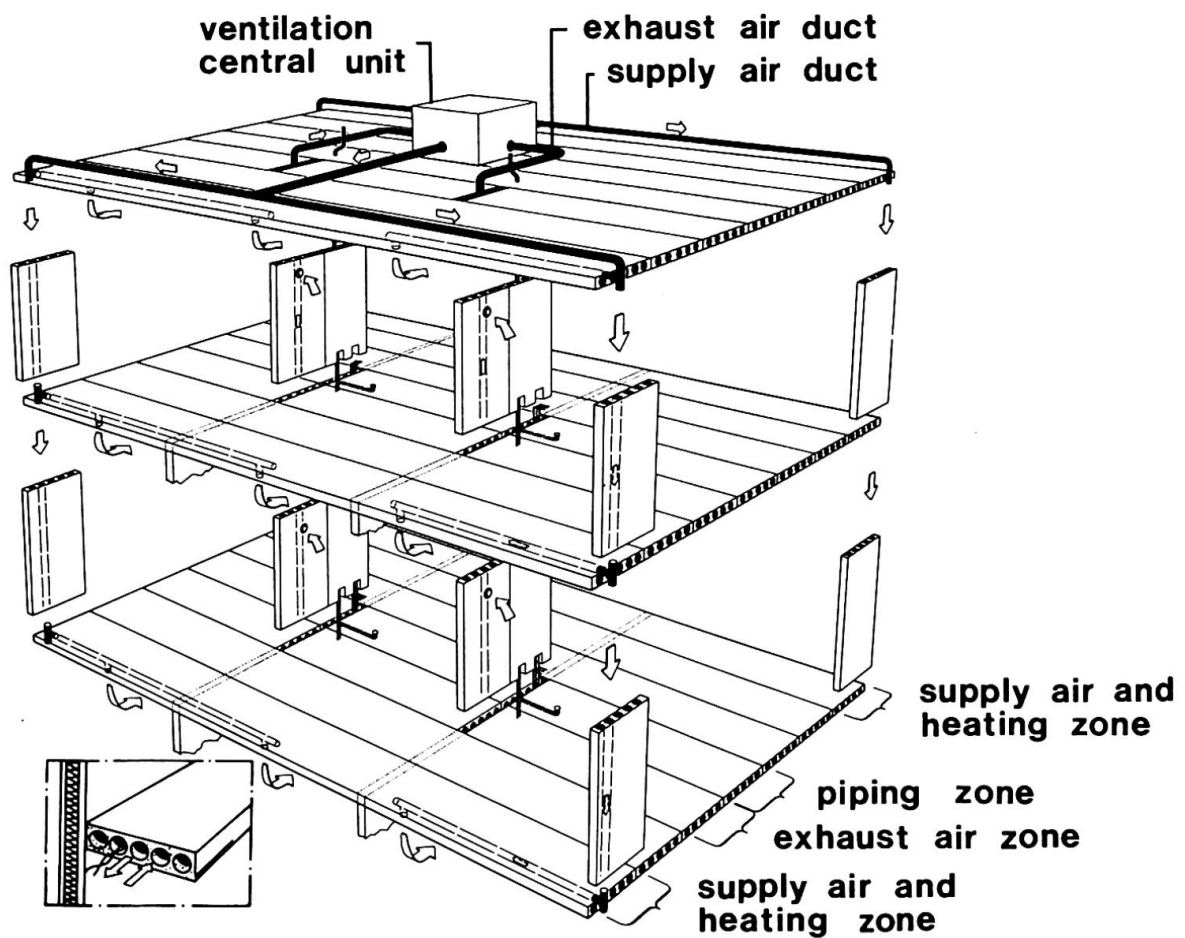
Innenklimaregelung mit einem integriertem Klima- und Bausystem

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EBES - integrated HVAC and building system

The heating and ventilation systems and structures in an open Finnish BES-element building system of multi-storey residential buildings are integrated into an energy economic overall EBES-system. The mechanical sound attenuated supply and exhaust ventilation system is equipped with heat recovery.



EBES - indoor climate and ventilation

The objective values for EBES-apartment indoor climate meet the recommended values in the new compiled Finnish Building Regulations D2:1987. In addition the following most important requirements of flexibility for man are fulfilled:

- Ideal room-based controlled temperature 21 ± 2 °C
- Controlled ventilation 0,65 - 1,0 1/h
- Draughtless silent ventilation 25 - 30 dB(A)
- Prevention of spreading smells
- Good sound insulation

EBES - air ductwork

The building frame in the EBES-system comprises floors made of hollow core slabs and bearing walls of hollow core elements. The hollows in the structures are used as supply and exhaust air ducts. The air ductwork is simple to design, easy to adjust, flow-technically stabile, sound technically controlled and allows changes in air flows when:

Maximum air velocities in the ductwork	m/s
• Main ducts of sheet metal	4,0
• Mutual ducts (vertical hollows)	3,0
• Room ducts (vertical or horizontal hollows)	2,0

EBES - building frame as energy storage

The exploitation of the building mass for storage of energy and as a part of the heating and ventilation system is profitable when combined radiation and ventilation heating is used. The building mass can be heat accumulated by preheating the supply air led into the hollow core structures or by installing electrical heating cables into the hollows. A room-based air terminal device heats the supply air and controls the indoor air temperature.

EBES - functional prerequisites

To avoid the disturbances that change the air flows in the ducts and in the whole building causing for example condensation and spreading smells and are caused by the thermal forces due to the temperature difference between the outdoor and indoor air and by the wind, the functional prerequisites in the cold, $t < -20$ °C, climate for EBES-system are:

- Maximum leakage air flow rates at test pressure of 50 Pa

Outer building envelope	0,5	1/h
Floors	0,1	dm ³ /(sm ²)
Doors	2,0	dm ³ /s
Air ducts	0,04	dm ³ /(sm ²)
- Minimum static pressure in the air ducts 100 Pa
- Mechanical supply/exhaust air flow rate 0,8
- Continuous air change
- Sound attenuated air terminal devices
- Control technique for the room-based heating effects.