

EXTENDED DATA INPUT FOR BALANCED VENTILATION

Planning ventilation systems with multiple ventilation units

Building: Primary School 8 "Sveti Sveti Kiril I Metodi" - Section B

Ventilation unit / Heat recovery efficiency design
In Ventilation worksheet (standard design)
In Additional Vent (this worksheet)

	(Ventilation worksheet)
x	(Additional vent)

Treated Floor Area A_{TFA}

m² 4630 (Areas worksheet)

Room Height h

m 2,50 (Worksheet Annual heating)

Room air volume for ventilation (A_{TFA}·h) = V_V

m³ 11576 (Worksheet Annual heating)

Number of Occupants

P 680,0 (Ventilation worksheet)

Room temperature

°C 20 (Worksheet Annual heating)

Average external temp. heating period

°C 4,5 (Ventilation worksheet)

Average ground temp.

°C 11,4 (Ground worksheet)

Ventilation type

Balanced PH-Ventilation with HR (Ventilation worksheet)

Results of ventilation design and unit selection:

Ventilation Unit no.	Description of the unit	Design		Average value / yr.	
		V _{SUP} m³/h	V _{ETA} m³/h	V _{SUP} m³/h	V _{ETA} m³/h
1	Parter				
2	First floor				
3	Second floor				
4	Floor -1				
5	Sector A 1 floor	750	750	235	235
6	Sector A 2 floor	400	400	179	179
7	Floor -1				
8	Parter				
9	Floor 1				
10					

Result for overall vent. syst.

1150	1150	414	414	0,04
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Effective heat recovery efficiency	Energy recovery value	spec. Input power	Heat recov. efficiency SHX	Cross check
81%	0%	0,40	0%	
79%	0%	0,40	0%	

80%	0%	0,40	0%
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Recommendations for dimensioning air quantities

Use of low odour and low-emission building materials/ furnishings:

It is strongly recommended to use building materials that cause no or only little pollution instead of increasing the outdoor air volume flow in order to reduce preventable pollution. This holds true independently from the chosen approach for the air quality determination; emissions of all sources in the room should be considered, e.g. furniture, carpets and ventilation or air-conditioning unit.

Assessment of volume flow rates according to the number of persons

Also in non-residential buildings, the number of persons is fundamentally important for assessing the volume air flow rates. For good indoor air quality the amounts of 20 to 30 m³/h/person are completely sufficient. Higher outdoor air amounts may lead to excessively dry indoor air in winter. The air flow rates are specified by classification according to EN 13779. The classification must be agreed with the client in advance. IDA 3 is adequate for office buildings. IDA 4 has proven satisfactory for school buildings as purge ventilation is carried out during breaks anyway. For typical external air CO₂ concentrations of around 400-500 ppm, it is possible to comply even with 1500 ppm. Exceeding this figure temporarily is permissible.

Fresh air flow rates per person:

- Recommended for residential buildings: around 30 m³/(h person)
- Recommended for offices and similar uses: around 30 m³/(h person) (AMEV: 28 m³/(h person); EN 13779 / IDA 3: at least 24 m³/(h person))
- Recommended for schools and day care centres: 15 to 20 m³/(h person) (Source: Guidelines for energy-efficient educational buildings, Passive House Institute, 2010)
- Recommendation for sport halls: 60 m³/(h person) (DIN 18032-1)

Purging phase for intermittent ventilation operation

Due to the purge ventilation phase, the ventilation operation period is extended accordingly (utilisation time + purge ventilation phase). Please consider this for the ventilation design. Emissions have to be removed. Flushing the building prolongs the utilization time of the ventilation system (utilization time + flushing phase). Please consider this at design stage.

Design of air quantities

When designing the air quantities, please consider the design recommendations given above. The ventilation operation period can be determined on the basis of the daily utilisation hours including purging phase if applicable. In addition, time periods with reduced ventilation requirements (operation modes) can be taken into account by means of reduction factors.

Room Nr.	Amount a	Room name	Assignment to ventilation unit	Area A m²	Clear height h m	Room vol. A x h m³	Volume flow per room			Air change rate per room n 1/h	Utilisation times			Reduction Red.1	Operation Red. 1	Reduction Red.2	Operation Red.2	Reduction Red.3	Operation Red. 3	Cross check	Average volume flows			Average air change rate 1/h
							V _{SUP} m³/h	V _{ETA} m³/h	V _{TRANS} m³/h		h/d h	d/week d	weeks/yr Weeks								V _{SUP} m³/h	V _{ETA} m³/h	V _{TRANS} m³/h	
15	1	Computer classroom	5	51	3,30	168	375	300		2,24	20	7	32	100%	20%	70%	30%	40%	50%		117	94		0,70
16	1	Bookstore	5	16	3,30	52	50			0,96	20	7	32	100%	20%	70%	30%	40%	50%		16			0,30
17	1	Canteen	5	51	3,30	168	175	150		1,04	20	7	32	100%	20%	70%	30%	40%	50%		55	47		0,33
18	1	WC	5	8	3,30	26		100		3,83	20	7	32	100%	20%	70%	30%	40%	50%			31		1,20
19	1	Corridor	5	41	3,30	136	150	200	80	1,47	20	7	32	100%	20%	70%	30%	40%	50%		47	63	25	0,46
20	1	Corridor 2	5	8	3,30	26			80	3,03	20	7	32	100%	20%	70%	30%	40%	50%				25	0,95
21	1	Teachers room	6	17	3,30	56	50			0,89	20	7	50	100%	15%	60%	35%	40%	50%		22			0,40
22	1	Teachers room	6	33	3,30	109	100	50		0,92	20	7	50	100%	15%	60%	35%	40%	50%		45	22		0,41
23	1	Teachers room	6	16	3,30	52	50			0,96	20	7	50	100%	15%	60%	35%	40%	50%		22			0,43
24	1	Teachers room	6	51	3,30	169	200	150		1,19	20	7	50	100%	15%	60%	35%	40%	50%		90	67		0,53
25	1	WC	6	8	3,30	26		100		3,83	20	7	50	100%	15%	60%	35%	40%	50%			45		1,72
26	1	Corridor	6	41	3,30	136		100		0,74	20	7	50	100%	15%	60%	35%	40%	50%			45		0,33
27	1	Corridor 2	6	8	3,30	26			100	3,79	20	7	50	100%	15%	60%	35%	40%	50%				45	1,70
Additional lines: Please mark complete lines above, copy and paste multiple times																					414	414	---	0,36

Ventilation unit selection

Up to 10 different ventilation units are considered. By changing the amount, identical units can be considered. The data from PHI certified ventilation units as well as the entry data lines for user data for other ventilation units can also be found in the worksheet "Components". When choosing to use a compact unit the standard design in the Ventilation worksheet has to be used.

Go to ventilation units list																								
Ventilation Unit no.	Quantity	Description Ventilation units	Selection Unit type	Design vol. flow per unit m³/h	Entry area for volume flow rate from to m³/h m³/h	Electrical efficiency Wh/m³	Pressure loss calculation			Entry area		Cross check ----- Pressure loss assessment	Interior location (x)	Exterior location (x)	Heat recovery efficiency Unit effective	Energy recovery value	Frost protection necessary	Subsoil HX		U noise level < 35dB(A)	Noise protecti adapter Supply air db(A)			
	[-]						Δp _{duct} Pa	Δp _{duct} Pa	Δp _{system} Pa	Δp _{external} Pa	Δp _{internal} Pa					[-]	[-]		Effective- efficiency degree	Efficiency of heat recovery				

Change sorting type																							
1	1	Parter	06ud Tangra ventilation unit EVB 16 HI					55	55	65				x									
2	1	First floor	06ud Tangra ventilation unit EVB 16 HI					55	55	65				x									
3	1	Second floor	06ud Tangra ventilation unit EVB 16 HI					55	55	65				x									
4	1	Floor -1	07ud Tangra ventilation unit EVB 20 HI					55	105	90				x									
5	1	ector A 1 floc	02ud Tangra ventilation unit EVB 06 HI	750	250	600	0,40	45	45		100	-	ok	x		0,82	81%	0%	yes		0%	n.a.	61
6	1	ector A 2 floc	01ud Tangra ventilation unit EVB 04 HI	400	150	400	0,40	45	45		100	-	ok	x		0,82	79%	0%	yes		0%	n.a.	57
7	1	Floor -1	02ud Tangra ventilation unit EVB 06 HI					55	50					x									
8	1	Parter	06ud Tangra ventilation unit EVB 16 HI					65	55	60				x									
9	1	Floor 1	07ud Tangra ventilation unit EVB 20 HI					70	55	70				x									
10																							

Data entries for duct sections between the ventilation unit and the thermal envelope

The duct sections between the ventilation unit and the thermal envelope should be as short as possible and should be well insulated, both for interior as for exterior location of the ventilation unit. These duct sections can be entered here. The heat losses of the overlying duct section will be considered for the effective heat recovery efficiency.
An entered duct section can also be used for multiple ventilation units.
If in the section "Ventilation unit - selection" in one line a ventilation unit is selected as multiple units (amount larger than 1 for identical units), then the corresponding duct sections may simply be entered (duct sections for one ventilation unit).

Temperature of the location of installation 20,0 (only enter when at least one unit is installed outside of the thermal envelope)																							
Quantity	Cross check	Round duct ins. diameter mm	Rectangular duct		Insulation Thickness mm	Thermal conducti- vity W/(m K)	Reflective insulation duct (x)	Transmittance duct W/(m K)	Length of Supply air m	Ambient or Extract air Duct (t)	Exhaust or flow Duct (t)	Duct type	Design Volume rate	Allocation to ventilation units (when central unit applicable enter "1")									
														Vent. Unit 1	Vent. Unit 2	Vent. Unit 3	Vent. Unit 4	Vent. Unit 5	Vent. Unit 6	Vent. Unit 7	Vent. Unit 8	Vent. Unit 9	Vent. Unit 10
1		200			150	0,033		0,216	2	1		Ambient air	750					1					
1		200			100	0,033		0,279	3		1	Forluft	750					1					
1		200			150	0,033		0,212	5,5	1		Ambient air	400						1				
1		200			100	0,033		0,273	6,5		1	Forluft	400						1				

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