

HEAT RECOVERY VENTILATION · PN-83/B-03430

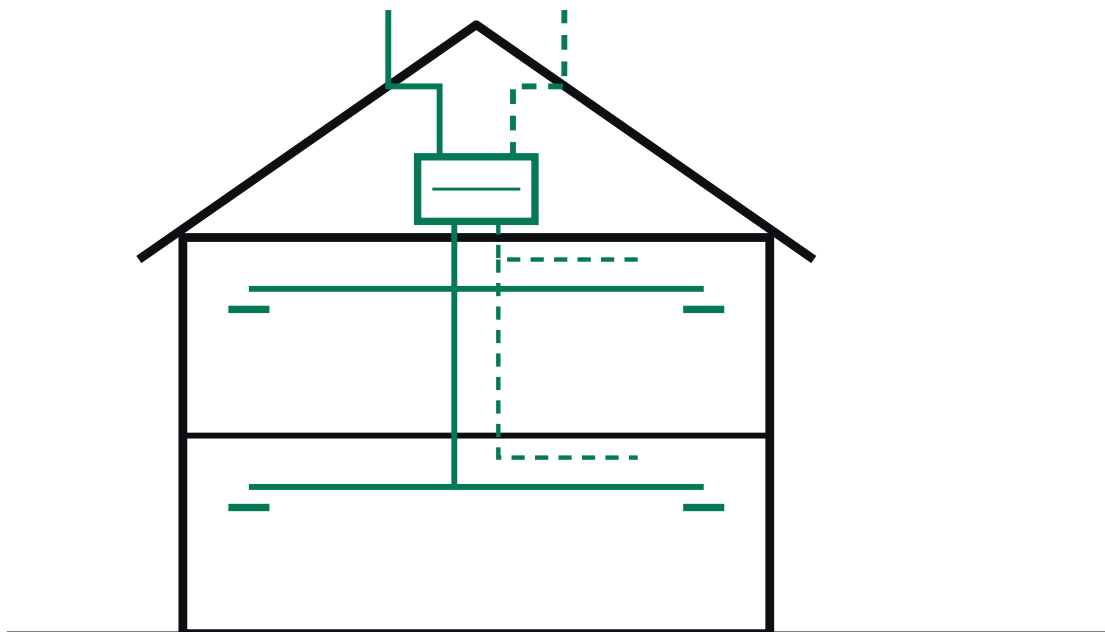
Mechanical ventilation design

13 rooms · 18 runs · 2 storeys

FOR

Sarah Fox

14 Rowan Close, Leeds



Design flow

258 m³/h

Q rooms

250 m³/h

Required available pressure

63 Pa

Air balance

The unit runs at **258 m³/h** - the larger side: supply 258, extract 216 m³/h.

258 m³/h

Design flow - the unit has to cover it

250 m³/h

Q rooms - the reduced mode is measured from it [\[1\]](#)



Room air flows

The standard's three criteria, the adopted value, and the flow after balancing

Room	V m³	NORM CRITERIA M³/H			RESULT M³/H		Clause
		Standard minimum	Occupancy	Recommended	Adopted	Balanced	
Supply						258	
Living room	60.1	0	0	60	60	60	-
Guest room	35.6	0	0	36	36	36	-
Children's room	40.4	30	20	40	40	40	2.1.2 + Az3 pt 2
Study	21.0	30	0	21	30	30	2.1.2 + Az3 pt 2
Main bedroom	49.0	30	40	49	49	49	2.1.2 + Az3 pt 2
Bedroom	43.2	30	20	43	43	43	2.1.2 + Az3 pt 2
Extract						258	
Kitchen-diner	46.1	50	0	92	92	110	2.1.2
WC	8.9	30	0	18	30	36	2.1.2
Utility room	21.8	0	0	44	44	52	-
Bathroom	21.0	50	0	42	50	60	2.1.2
Transfer							
Porch	6.9	0	0	7	7	7	-
Hall	176	0	0	18	18	18	-
Landing	24.1	0	0	24	24	24	-
Design flow - the larger side						258	

The "Adopted" column is the largest of the three criteria; the one that governed is in bold.

Residents: 4 (entered by the designer). The windowed electric kitchen's flow follows from it (clause 2.1.2).

[1] PN-83/B-03430, clause 2.1.2 - the ventilation air flows for the rooms.

FOR THE BUILDER AND THE CLIENT

To build

The report does not calculate these requirements - it states them. Tick each line on site.

Transfer openings in the doors

net area of the undercut or grille

	REQUIRED					
Room	Min. cm²	Gap, 80 cm door	Basis		Existing opening	Done
Kitchen-diner	200	2.5 cm	2.1.7		-	☐
WC	220	2.8 cm	2.1.7 + WT § 79 ust. 1		-	☐
Living room	80	1.0 cm	2.1.6		-	☐
Guest room	80	1.0 cm	2.1.6		-	☐
Children's room	80	1.0 cm	2.1.6		-	☐
Bathroom	220	2.8 cm	2.1.7 + WT § 79 ust. 1		-	☐
Study	80	1.0 cm	2.1.6		-	☐
Main bedroom	80	1.0 cm	2.1.6		-	☐
Bedroom	80	1.0 cm	2.1.6		-	☐

Required net area of the door undercut or grille. The gap is the area divided by an 80 cm door width, rounded up. [2]

Recommendation: with mechanical ventilation every internal door has a ventilation undercut. Tell the client before the doors are ordered (SPW 2024, section 3.10).

Conditions confirmed by the designer

- ☐ The intake is at least 8 m in plan from streets, car parks above 20 spaces, waste stores and sewer vents (WT § 152(3)).
- ☐ Wall discharge: the opposite wall of a neighbouring building is at least 10 m away with windows, or 8 m without (WT § 152(9)(2)).

The designer confirmed these conditions without a measurement. The report holds no measured value - check them on site.

[2] PN-83/B-03430, clauses 2.1.6 and 2.1.7, WT § 79(1) - transfer openings between rooms.

Duct schedule

18 duct runs, 71.5 m in all.

Diameters sized for a design velocity of 3.0 m/s; flexible pipes 2.5 m/s in each pipe

RUN			DUTY		RESULT		
Run	Storey	Serves	V m³/h	L m	DN mm	w m/s	Insulation
Supply 9 runs			40.5				
R1	Ground floor	Living room	60	8.7	2×75	2.68	no
R2	Ground floor	Guest room	36	4.7	2×75	1.59	no
R3	Ground floor	-	162	1.9	160	2.24	no
R4	Ground floor	-	162	2.9	160	2.24	no
R5	Ground floor	-	258	1.3	200	2.28	no
R6	First floor	Children's room	40	6.8	2×75	1.80	no
R7	First floor	Study	30	3.8	2×75	1.34	no
R8	First floor	Main bedroom	49	7.0	2×75	2.18	no
R9	First floor	Bedroom	43	3.3	2×75	1.92	no
Extract 7 runs			26.5				
R10	Ground floor	Kitchen-diner	110	10.0	2×90	3.56	no
R11	Ground floor	WC	36	2.7	75	3.20	no
R12	Ground floor	Utility room	52	1.2	75	4.65	no
R13	Ground floor	-	60	4.0	100	2.12	no
R14	Ground floor	-	60	2.9	100	2.12	no
R15	Ground floor	-	258	1.4	200	2.28	no
R16	First floor	Bathroom	60	4.3	2×75	2.67	no
Outdoor air intake 1 run			2.8				
R17	Ground floor	-	258	2.8	200	2.28	no
Exhaust air outlet 1 run			1.8				
R18	Ground floor	-	258	1.8	200	2.28	no
Total · 18 runs			71.5				

An asterisk (*) marks a value the installer typed instead of the computed one. "no zone set" means a storey on the run's path has not been marked heated or unheated yet.

The run marks are the same on the drawing, in the resistance tables, on the commissioning sheet and in the findings.

Requirement and unit

The installation asks for **258 m³/h** at **63 Pa**. The chosen unit: **74 %** of its flow used.

What the installation asks

before a unit is chosen

258 m³/h

Design flow

63 Pa

Required available pressure

Extract

Governing side

Reduced mode flow	181 m ³ /h	Boost mode flow	284 m ³ /h
Pressure reserve (installer's assumption)	20 %		
Supply side resistance	40.3 Pa	Exhaust side resistance	52.4 Pa
Required available pressure	62.9 Pa		

Values copied from the sections that determine them: the balance, the installation resistance, the operating modes and the unit's declared data. The pressure reserve is the installer's design assumption, not a requirement of the standard.

What the chosen unit gives

HRV 350 EC Typed from the DTR

+ Flow covered

Flow utilisation 74 %

the unit gives | the installation needs

+ Pressure covered

203 / 63 Pa

Static pressure margin over the installation 140 Pa

Supplier		Model	HRV 350 EC
Source of the figures	Typed from the DTR	Catalogue efficiency	88 %
Efficiency used in the heat load	82 %		

The catalogue efficiency is measured under regulation 1253/2014 and does not describe this building. The heat-load efficiency is the value the heat losses were calculated at.

The unit's available static pressure covers the drawn installation at the design point.

! This unit's figures were typed from its DTR and were not checked against the EPREL register - the report will say so.

Installation resistance

Extract governs: **52.4 Pa**. Supply: 40.3 Pa.

40.3 Pa

Supply side

52.4 Pa

Exhaust side · governing - the installation's resistance

Critical route - supply

to: Living room · 12.8 m

Run	Part	Length m	Share of the loss	Loss Pa
R5	branch	1.3		5.38
R1	branch	8.7		28.45
R17	intake / discharge leg	2.8		6.45
Total		12.8		40.28

Critical route - exhaust

to: Utility room · 4.4 m

Run	Part	Length m	Share of the loss	Loss Pa
R15	branch	1.4		5.41
R12	branch	1.2		42.03
R18	intake / discharge leg	1.8		4.95
Total		4.4		52.39

Runs from the unit outwards: first the branch to the terminal, then the intake or the discharge.

Run losses are computed with the same resistance function that selected the critical route; the runs sum to the route's resistance.

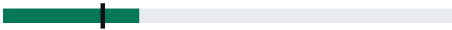
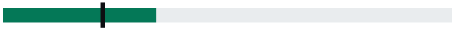
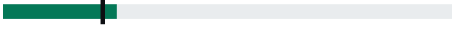
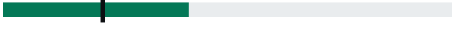
Operating modes

Every declared mode is permitted.

Mode	When	V m ³ /h	Share %	Verdict
Normal	Nominal · daytime	258	100	+ Permitted
Night	Reduced · night	181	70	+ Permitted
Boost	Boost · daytime	284	110	+ Permitted

Mode "Night" - flows against the norm floor

m³/h

Room	Floor m ³ /h	In mode m ³ /h	In mode against the floor
Kitchen-diner	30.0	77.2	
WC	18.0	25.1	
Children's room	18.0	28.3	
Bathroom	30.0	41.9	
Study	18.0	21.0	
Main bedroom	18.0	34.3	
Bedroom	18.0	30.2	

 flow in the mode  below the floor | floor: 60 % of the norm minimum

The flow may be reduced in the night period only, and no lower than 60 % of the value required for the room in question. The floor is worked out per room from the standard's table, not from the dwelling total.

FOR THE INSTALLER · ON THE LADDER

Commissioning sheet

Set each terminal to its setting, measure with an anemometer, write the reading and tick the box. At night, do not go below the night minimum.

DESIGN			SETTING			ON SITE	
Room	Flow m³/h	Terminals	Setting m³/h	Night min. m³/h	Damper	Measured m³/h	OK
Supply							
Living room	60	S1	60.1	-	-	.....	☐
Guest room	36	S2	35.6	-	-	.....	☐
Children's room	40	S3	40.4	18.0	-	.....	☐
Study	30	S4	30.0	18.0	-	.....	☐
Main bedroom	49	S5	49.0	18.0	-	.....	☐
Bedroom	43	S6	43.2	18.0	-	.....	☐
Extract							
Kitchen-diner	110	E1	110.3	30.0	-	.....	☐
WC	36	E2	35.9	18.0	-	.....	☐
Utility room	52	E3	52.2	-	-	.....	☐
Bathroom	60	E4	59.8	30.0	-	.....	☐
Transfer							
Porch	7	-	-	-	-	.....	☐
Hall	18	-	-	-	-	.....	☐
Landing	24	-	-	-	-	.....	☐

The "Measured" column is blank - the installer fills it with an anemometer while commissioning. The setting is the room flow divided between its terminals. A damper means the duct to that terminal carries a regulating damper.

Commissioning date

Anemometer (model, no.)

Signature

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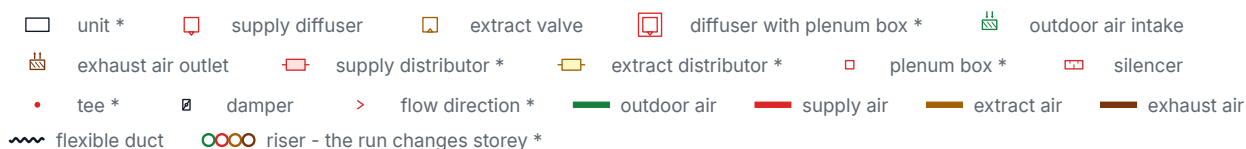
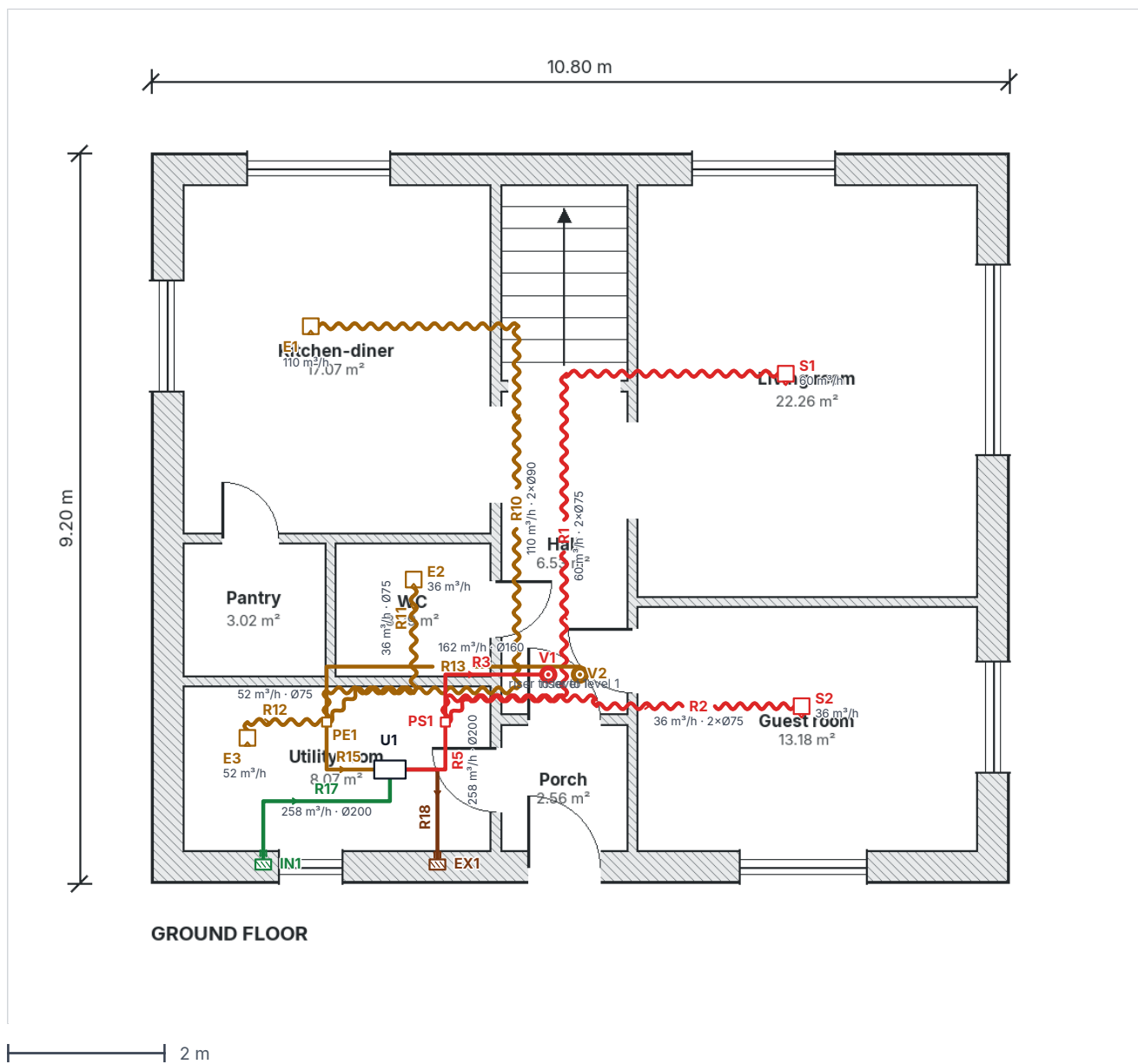
FOR THE WHOLESALER

Bill of materials

Kinds and quantities, no maker's catalogue - the wholesaler matches its own codes. Write what was ordered and tick what arrived.

Item	DN	Quantity	Unit	Ordered	On site
Unit and outdoor ends					
Ventilation unit	-	1	pcs	.....	☐
Intake	-	1	pcs	.....	☐
Discharge	-	1	pcs	.....	☐
Ducts and insulation					
Spiral duct	Ø100	6.9	m	.....	☐
Spiral duct	Ø160	4.8	m	.....	☐
Spiral duct	Ø200	7.3	m	.....	☐
Flexible duct	Ø75	81.2	m	.....	☐
Flexible duct	Ø90	20.0	m	.....	☐
Boxes and terminals					
Terminal	-	10	pcs	.....	☐
Plenum box	1×Ø75	2	pcs	.....	☐
Plenum box	2×Ø75	7	pcs	.....	☐
Plenum box	4×Ø75	1	pcs	.....	☐
Plenum box	8×Ø75	1	pcs	.....	☐
Plenum box	2×Ø90	1	pcs	.....	☐
Plenum box	-	1	pcs	.....	☐
Fittings					
Elbow	-	8	pcs	.....	☐

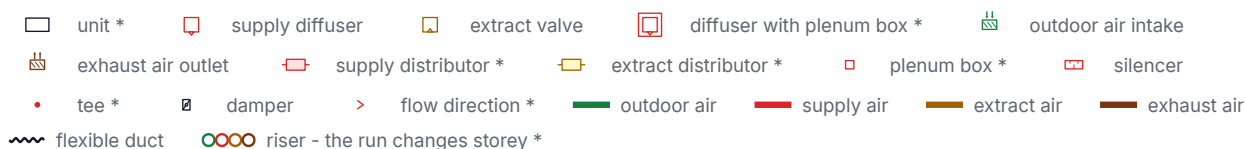
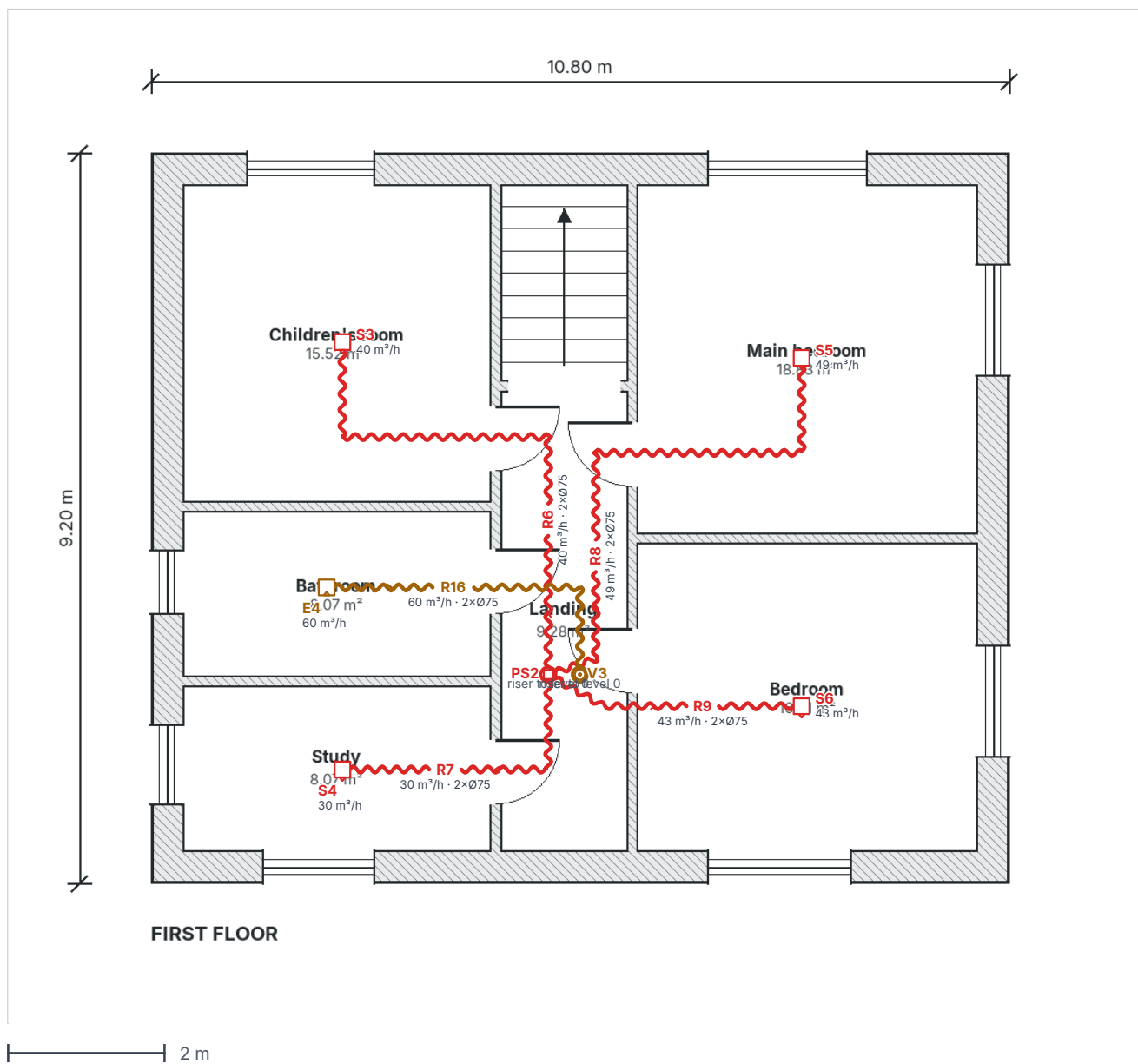
Installation drawing - Ground floor



Symbols and air stream colours to EN 12792. * - a HeatAlgo symbol, the standard has none for it. The arrows at the intake and discharge grilles are ours too.

a run's mark on the duct, its flow in m³/h and diameter under it; beside a terminal its mark and flow

Installation drawing - First floor



Symbols and air stream colours to EN 12792. * - a HeatAlgo symbol, the standard has none for it. The arrows at the intake and discharge grilles are ours too.

a run's mark on the duct, its flow in m³/h and diameter under it; beside a terminal its mark and flow

Design findings

1 warning to weigh - it blocks nothing.

 error - blocks the design  warning - to weigh

Warnings · 1

 In the boost mode the air travels 5.12 m/s along this run, above 5 m/s - at that speed the duct starts to be audible in the room. The pressure is computed correctly; this is about comfort.
Mode: Boost · Run: R12 · see #07

| The norm's refusals of operating modes are on this list in the preview too.

Calculation method

Seven formulas, each with its source. The same engine computes the app and this report.

$$V = \max(V_{\text{tab}}, n_{\text{occ}} \cdot 20 \text{ m}^3/\text{h}, n \cdot V_{\text{room}})$$

PN-83/B-03430 with Az3: cl. 2.1.2 (norm minimum), cl. 3.1 by analogy (20 m³/h per person, rooms at least 1/h); wet rooms 2/h - the module's assumption

Each room's flow is the largest of the three criteria; in the table on #02 the one that decided is bold.

$$V_{\text{design}} = \max(\Sigma V_{\text{supply}}, \Sigma V_{\text{extract}})$$

Balance of a balanced installation

The smaller side is raised to the larger. That is the flow the unit has to cover.

$$Q_{\text{rooms}} = \Sigma V_{\text{tab}}$$

PN-83/B-03430 cl. 2.1.2

The sum of the norm minimums. The reduced mode's limit is measured from it, not from the design flow.

$$V_{\text{night}} \geq 0.6 \cdot V_{\text{tab}}$$

PN-83/B-03430 cl. 2.1.4 (as amended by Az3, item 3) - night period only

The floor is checked for each room the norm table covers, one by one. There is no reduction by day.

$$d = \sqrt{(4 \cdot V / (\pi \cdot w))}, w = 3.0 \text{ m/s}$$

Preliminary sizing at the module's chosen velocity; flexible ducts 2.5 m/s in each pipe

The diameter rounded up to a stock size; as many parallel flexible pipes as needed.

$$\Delta p = \Sigma (\lambda \cdot L/d + \Sigma Z) \cdot \rho \cdot w^2 / 2, \rho = 1.2 \text{ kg/m}^3$$

Darcy-Weisbach, λ from Colebrook-White; Z and roughness per PN-76/M-34034

A run's resistance; the sum along the worst path is the side's resistance. Required pressure = governing side's resistance · (1 + the installer's reserve).

$$A_{\text{open}} = 80 / 200 / 220 \text{ cm}^2, s = A / 80 \text{ cm}$$

PN-83/B-03430 cl. 2.1.6 and 2.1.7, WT § 79(1)

The transfer opening by kind of room; the gap is the area divided by an 80 cm door's width, rounded up.

PN-83/B-03430 was withdrawn by PKN in 2015 but remains binding: Annex 1 to the technical conditions regulation invokes it under § 149 ust. 1, so the air flows follow it. Bathroom and WC transfer openings were checked against § 79 ust. 1 of the regulation (220 cm²), and the placement of the intake and the discharge against § 152.

See the method: a reference house calculated in full: heatalgo.com/en/compliance

What this report rests on

PN-83/B-03430 + Az3:2000	Air flows (cl. 2.1.2, 3.1), transfer openings (cl. 2.1.6, 2.1.7), the night reduction (cl. 2.1.4 as amended by Az3).
WT (Polish building regulations), Dz.U. 2022 item 1225	§ 149 - cites PN-83; § 79(1) - 220 cm ² openings in a bathroom and a WC; § 152 - where the intake and the discharge go.
PN-76/M-34034	Local loss coefficients and duct roughness - the installation's resistance (#06).
EPREL register	The unit's declared data: flows, SFP, catalogue efficiency.
SPW 2024, cl. 3.10	Undercutting every internal door - a recommendation, not a requirement.

Duct sizing is a preliminary calculation at 3.0 m/s; the resistance is calculated separately. Formulas: page #12.