Smay
Ventilation
Systems

The Future of High-Rise Evacuation:
Pressure Differential Systems

GLOBAL RANGE

- Presence in 34 markets worldwide
- Focus on R&D and innovation - 4 patents
- Hundreds PDS implementations

SAVE THE DATE:
15/06/2023
SMAY.PL/PDS

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17.2.4 Added protection to stairs

An escape stair should have a protected lobby or protected corridor or a **pressure differential system** under the following circumstances:

a) where the stair is the only one serving a building [...]; or
b) where the stair serves any storey at a height greater than 18 m; or
c) where the building is designed for phased evacuation; or
[...]

10.1 Number of common stairs

Buildings with a storey **18 m or more** above ground or access level should either be provided with **at least two escape stairs**, or meet all of the following recommendations.

[…]

e) The staircase and associated lobby should be protected with

a pressurization system conforming to BS EN 12101-6

for a firefighting system (see Figure 19).

[…]

Draft for Public Comment

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Date: 06 August 2021
Origin: National

Latest date for receipt of comments: 6 October 2021 Project No. 2020/02769

Responsible committee: FSH/14 Fire precautions in buildings

Interested committees: B/208, B/209, B/538, B/538/1, B/559, EL/1/1, FSH/0, FSB/1, FSH/1, FSH/2, FSH/9, FSH/12, FSH/12/1, FSH/12/2, FSH/12/3, FSH/12/4, FSH/12/5, FSH/14, FSH/14/-/5, FSH/14/-/7, FSH/16, FSH/17, FSH/17/-/2, FSH/18, FSH/18/2, FSH/18/5, FSH/18/6, FSH/18/7, FSH/21, FSH/22, FSH/24, FSH/25, FSS/0, MHE/4, MHE/31, SVS/0, SVS/8/1

Title: Draft BS 9991 Fire safety in the design, management and use of residential buildings - Code of practice

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard
i) has any issues related to 3rd party IPR, patent or copyright
ii) affects other national standard(s)
iii) requires additional national guidance or information

**WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD.
THIS DRAFT IS NOT CURRENT BEYOND 6 October 2021**

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

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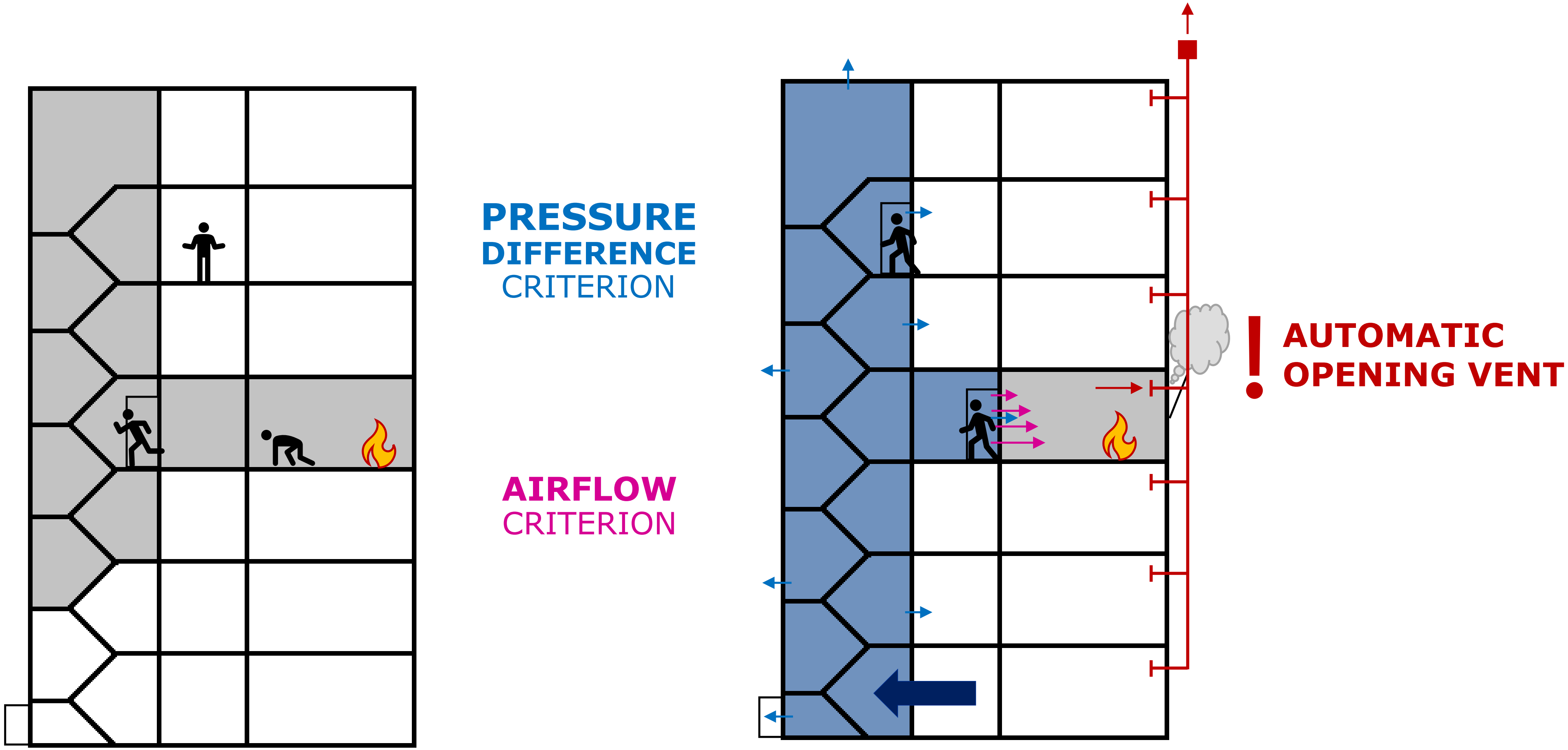
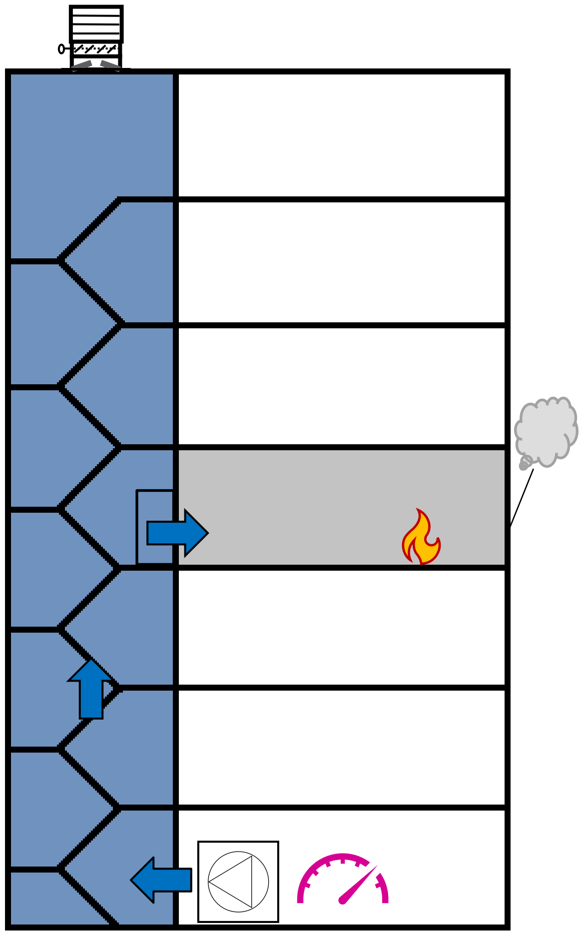
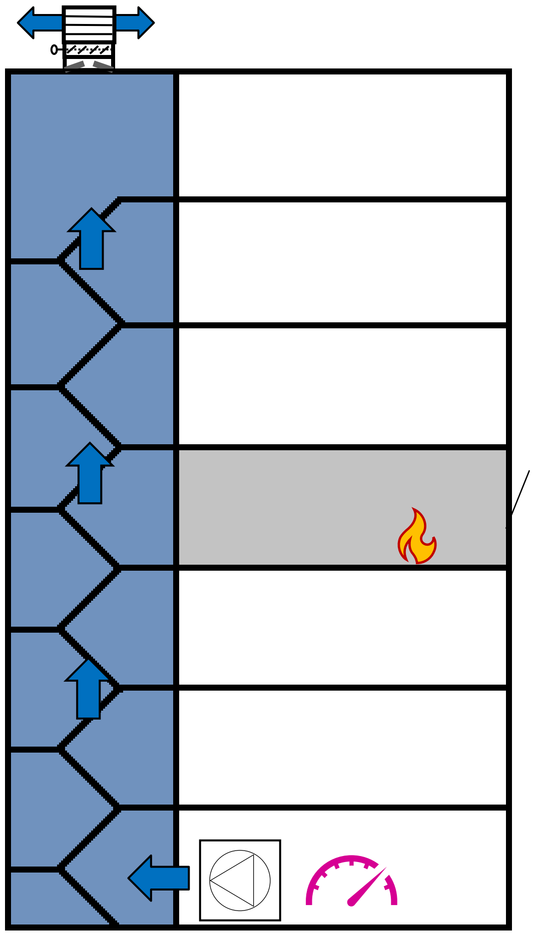

PRESSURE
DIFFERENCE
CRITERION
AIRFLOW
CRITERION
AUTOMATIC
OPENING VENT

MECHANICAL SYSTEMS

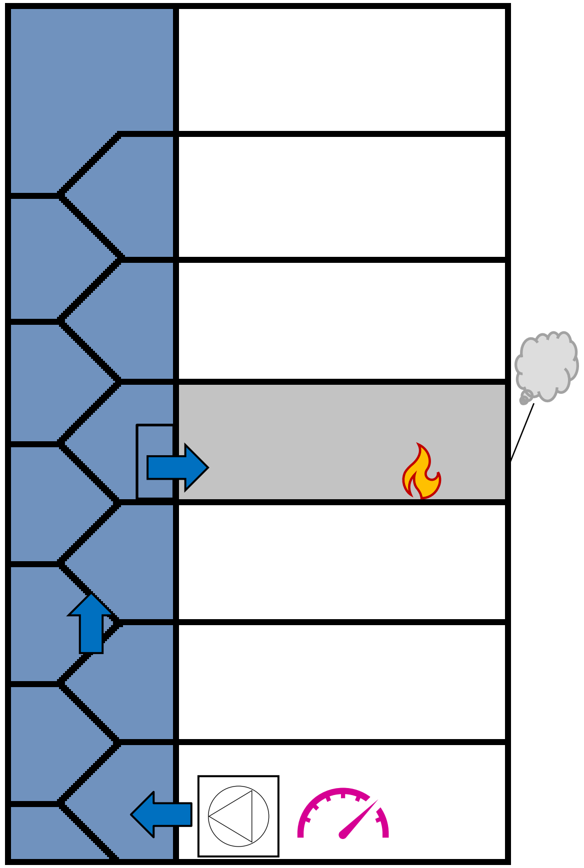


DOOR OPEN
AIR VOLUME SELECTED
FOR AIRFLOW CRITERION

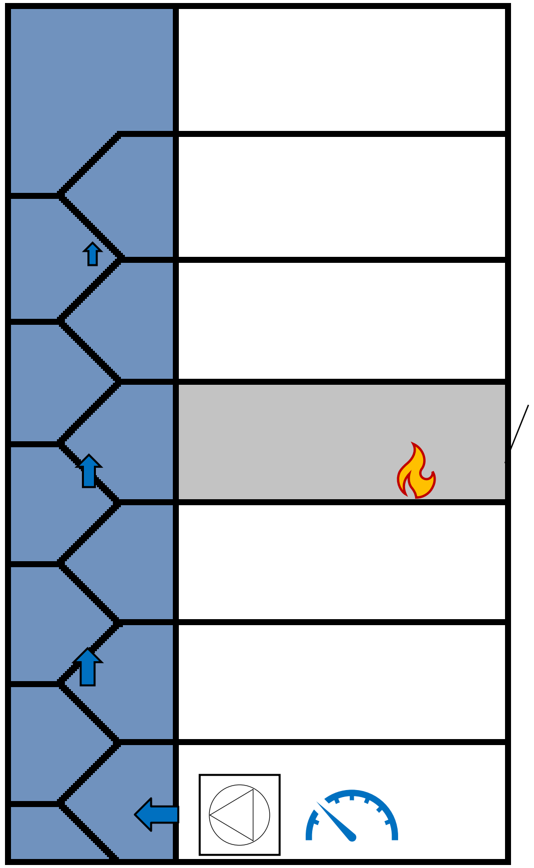


DOOR CLOSED
CONSTANT AIR VOLUME.
EXCESS AIR IS RELEASED WITH
THE PRESSURE RELIEF DAMPER

DYNAMIC FAN CONTROL SYSTEMS

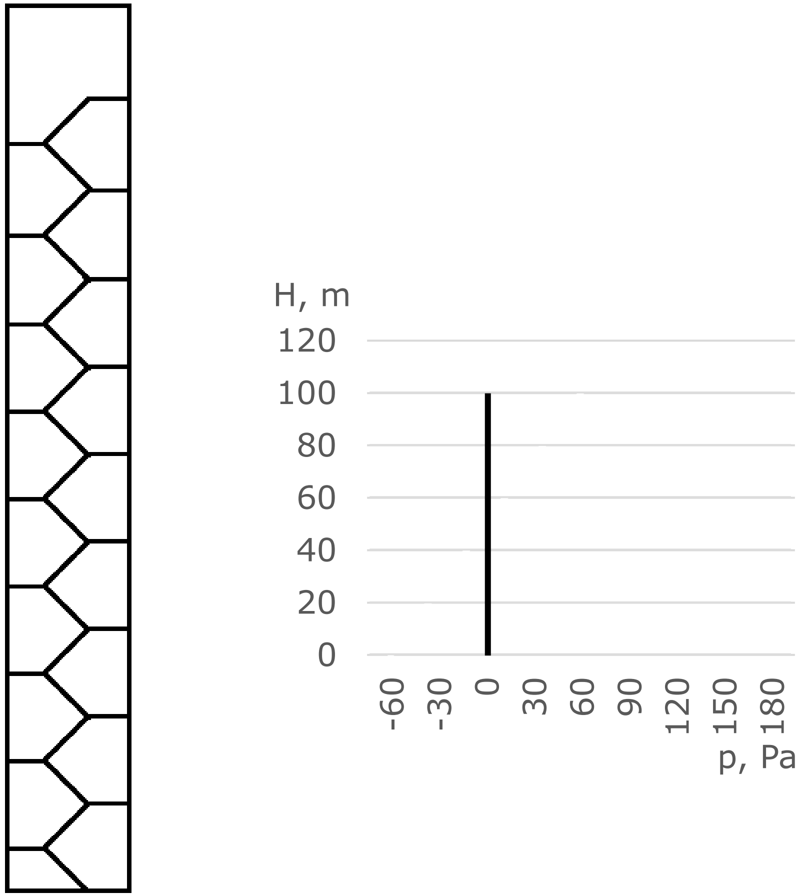


DOOR OPEN
AIR VOLUME SELECTED
FOR AIRFLOW CRITERION

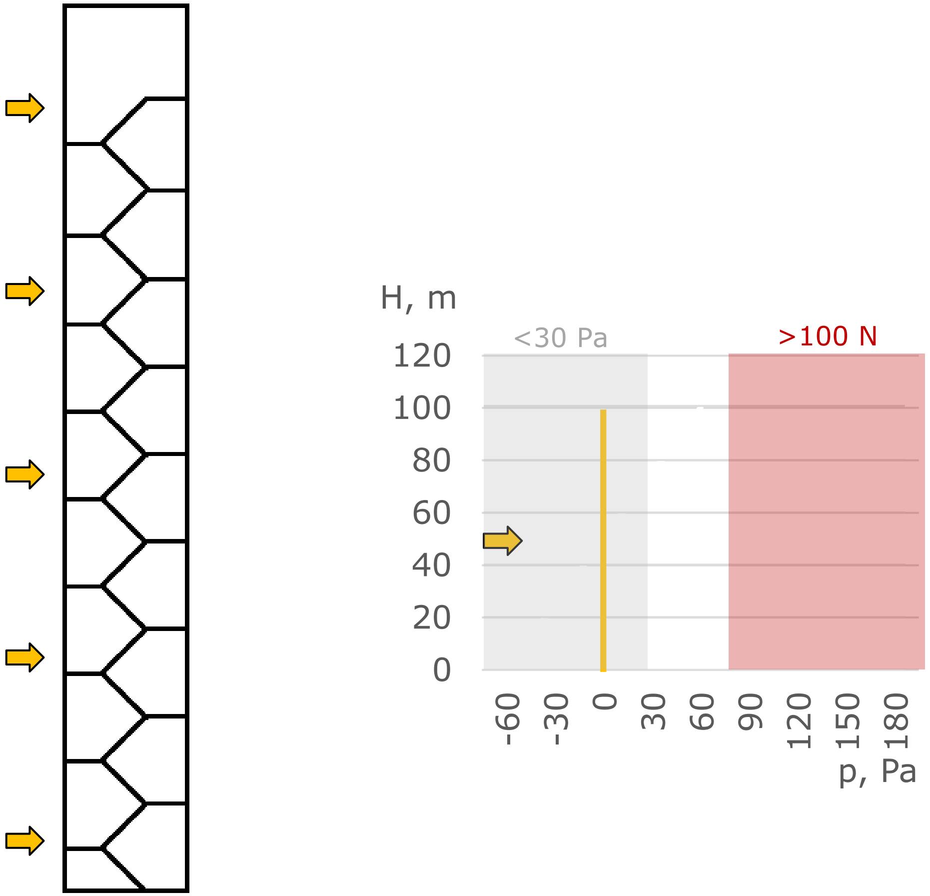


DOOR CLOSED
AIR VOLUME DECREASES
TO COMPENSATE AIR LEAKAGES
AND MAINTAIN OVERPRESSURE

ISOTHERMAL
T_{out}= 20°C



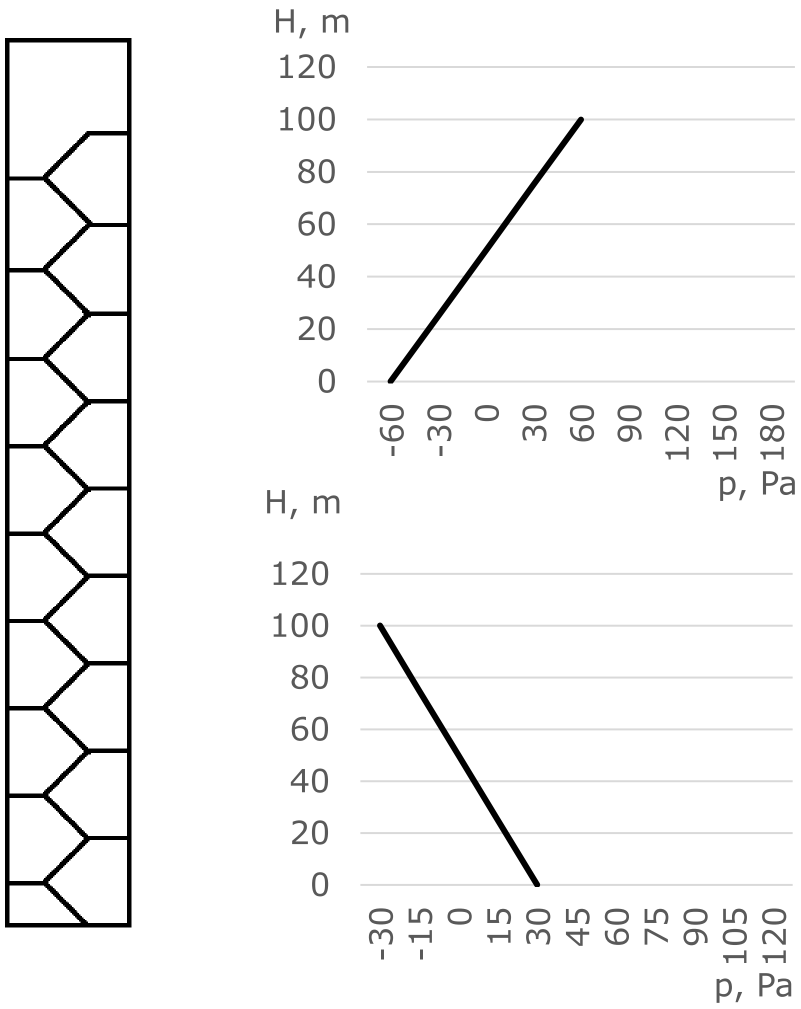
NATURAL DISTRIBUTION



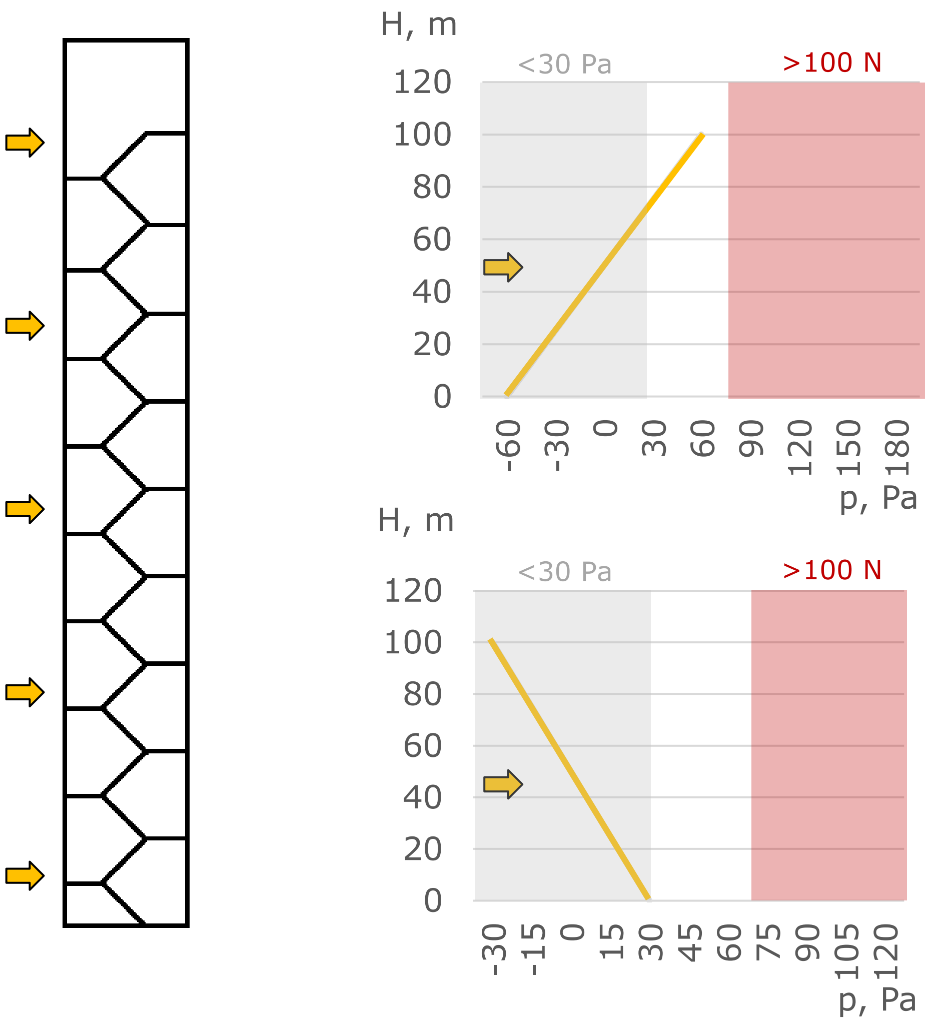
PRESSURIZATION

WINTER
T_{out}= -10°C

SUMMER
T_{out}= 38°C



NATURAL DISTRIBUTION



PRESSURIZATION

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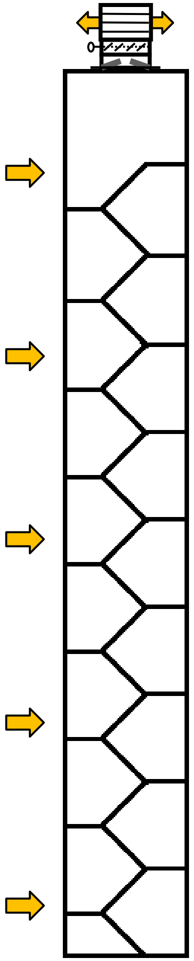
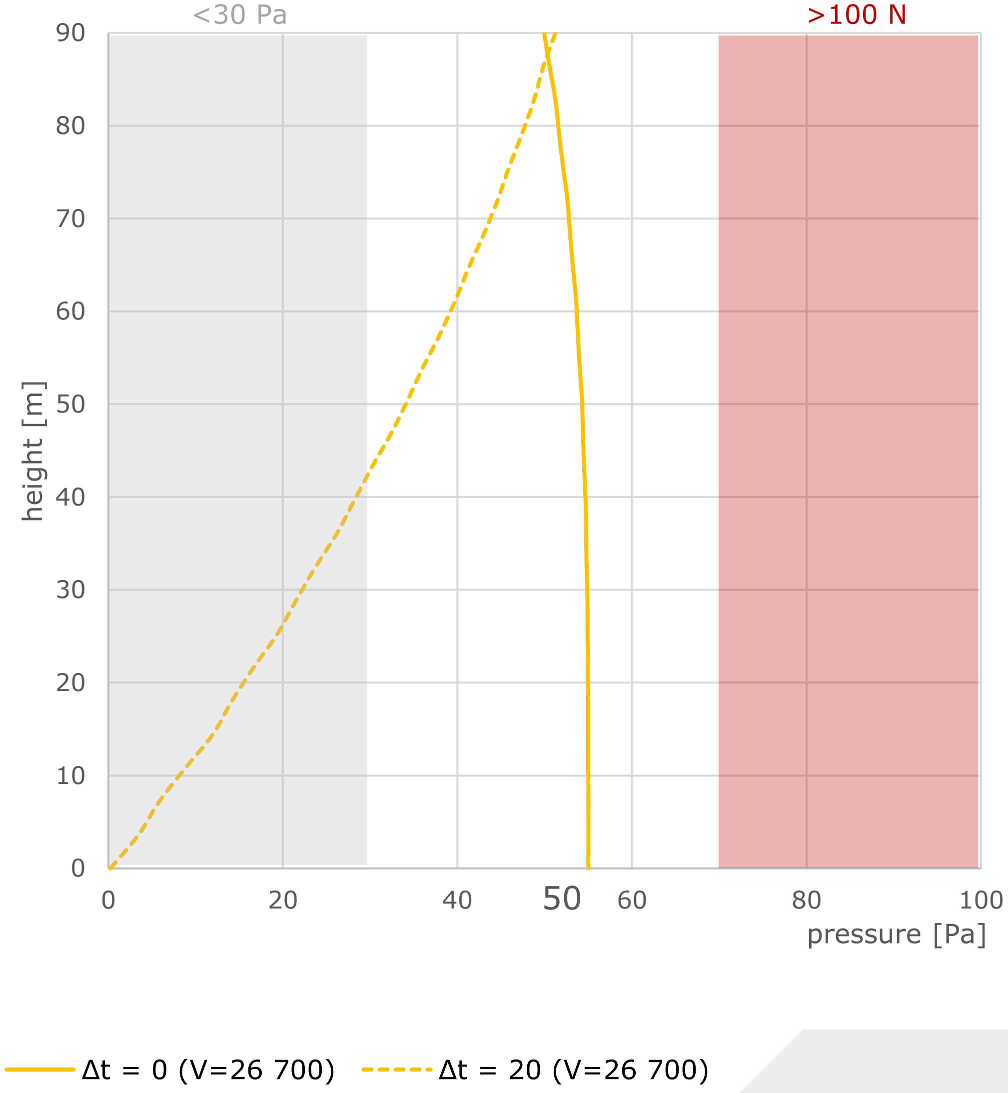
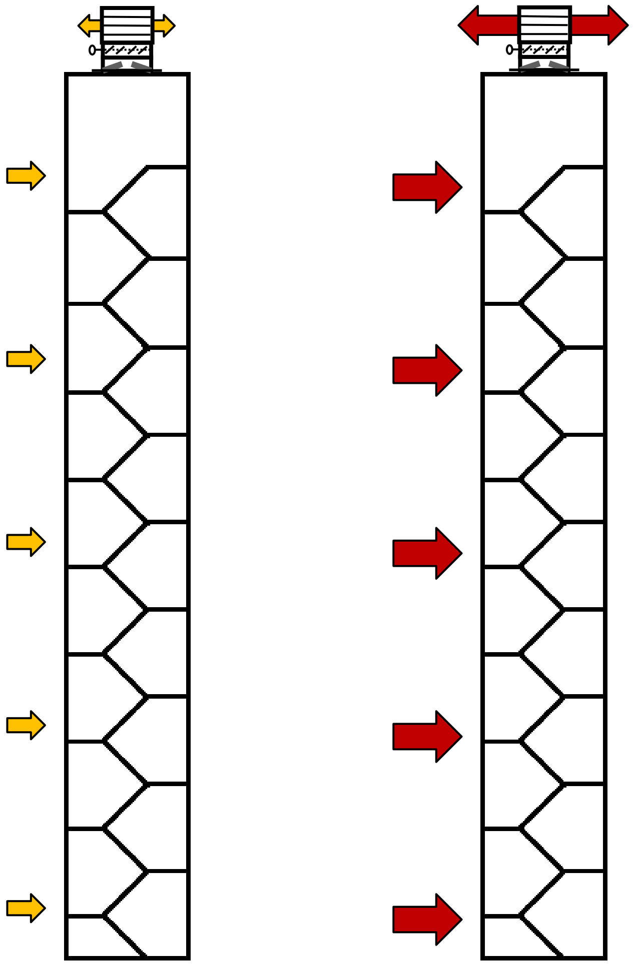
PRESSURE DISTRIBUTION
DIFFERENT PDS, 90m BUILDING



CONSTANT AIR VOLUME
V=26700 m³/h

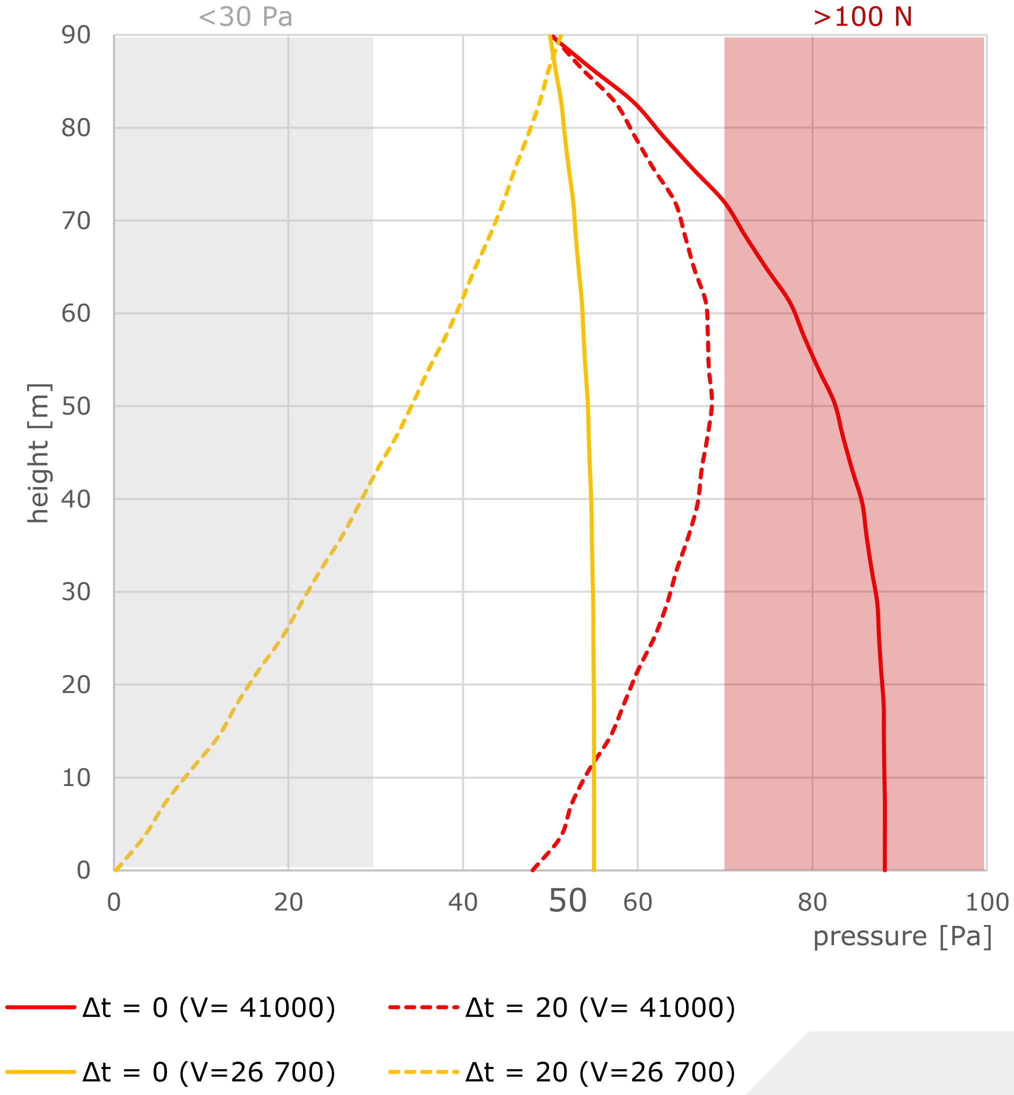


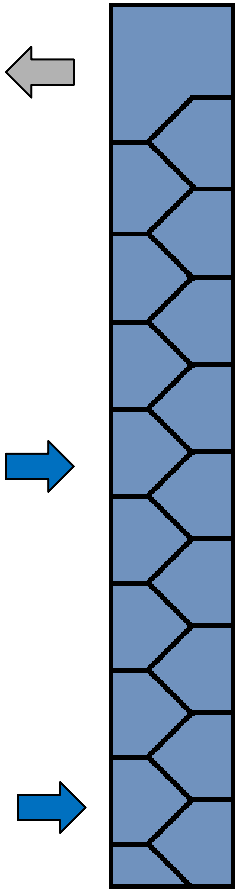
PRESSURE DISTRIBUTION
DIFFERENT PDS, 90m BUILDING

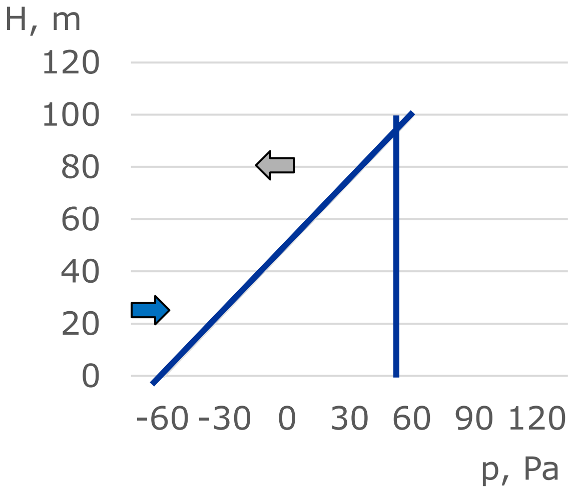


CONSTANT AIR VOLUME

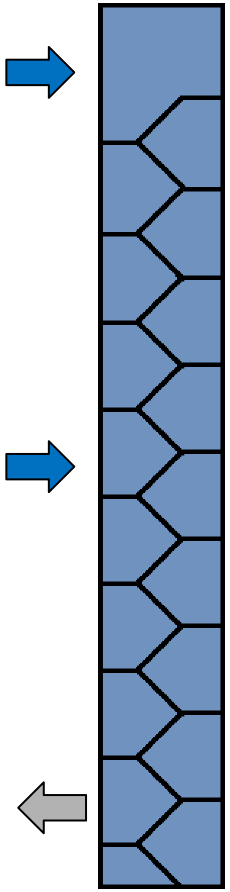
V=26700 m³/h **V=41000 m³/h**

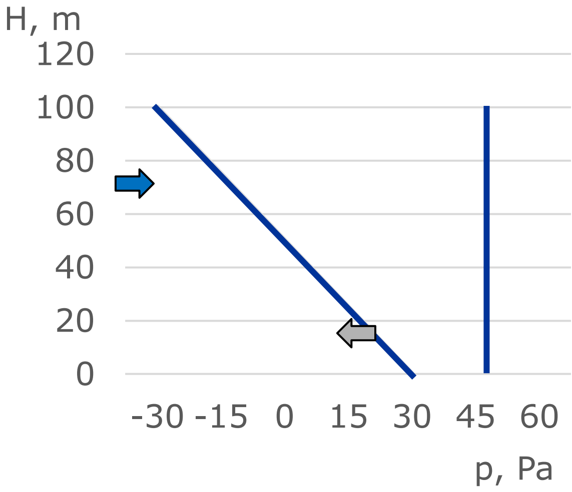






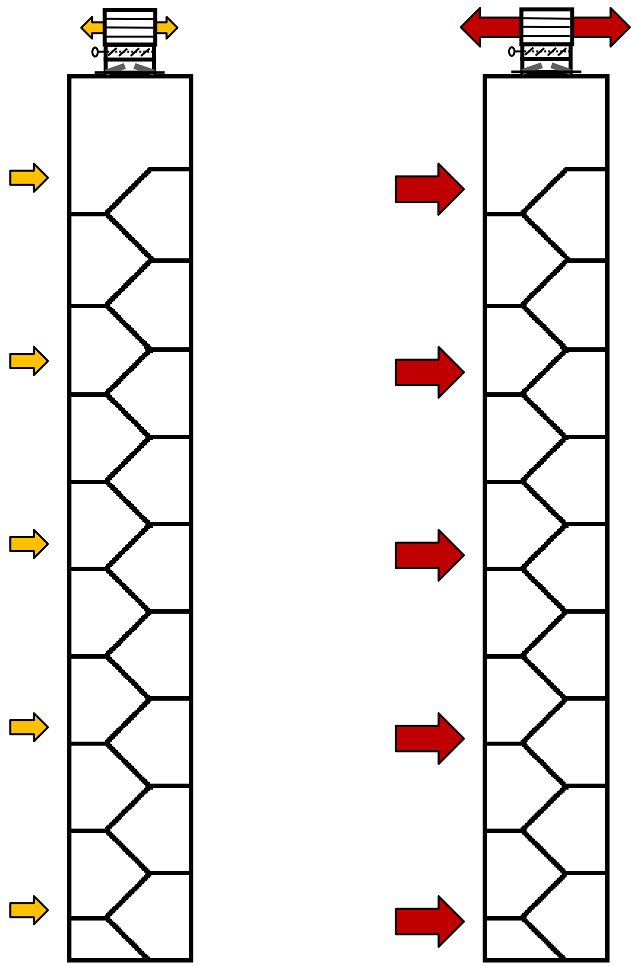
WINTER





SUMMER

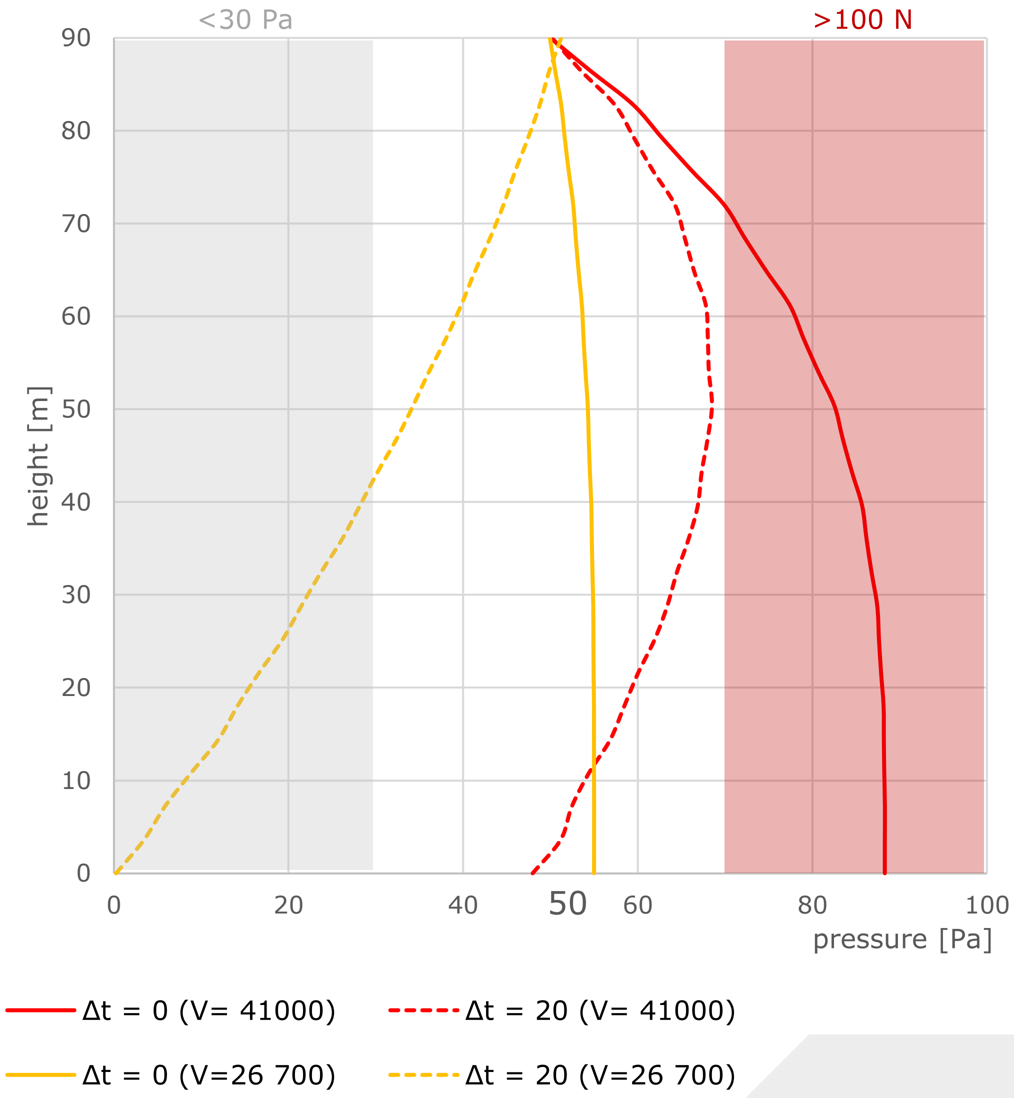
PRESSURE DISTRIBUTION
DIFFERENT PDS, 90m BUILDING



CONSTANT AIR VOLUME

V=26700 m³/h

V=41000 m³/h



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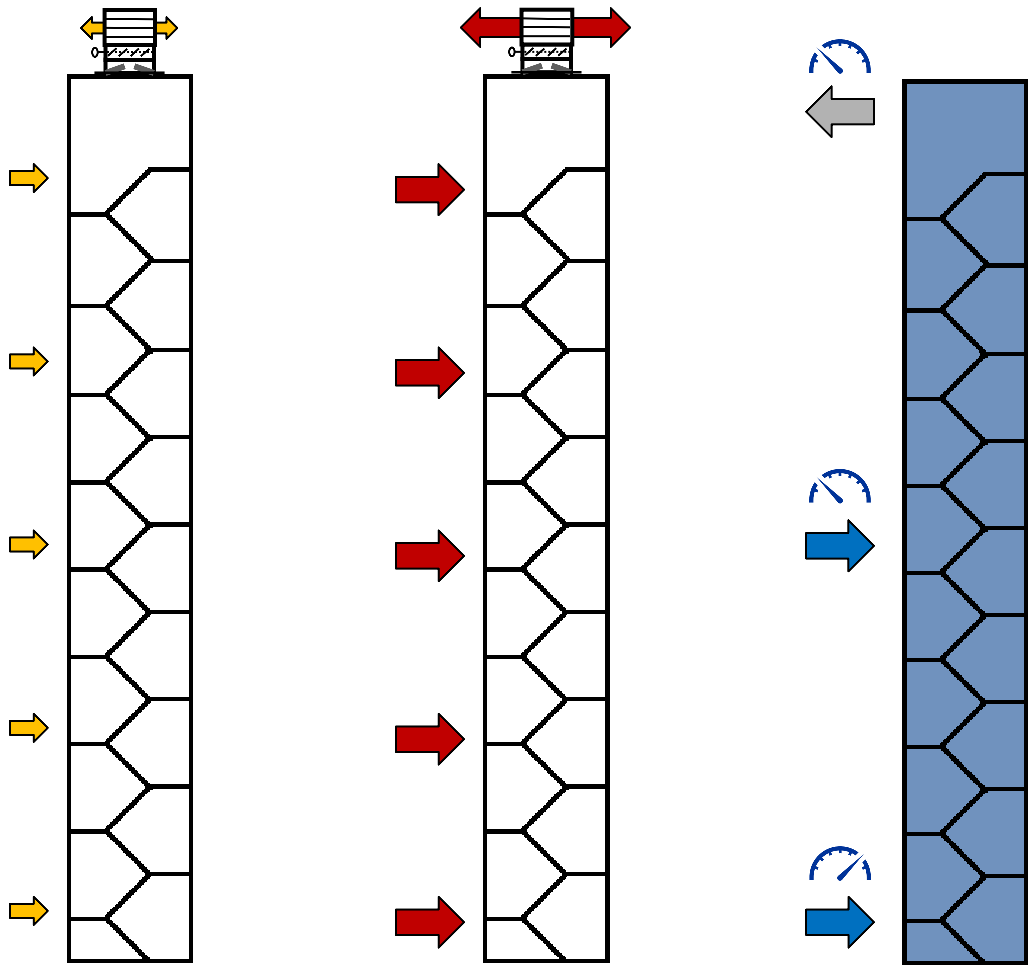
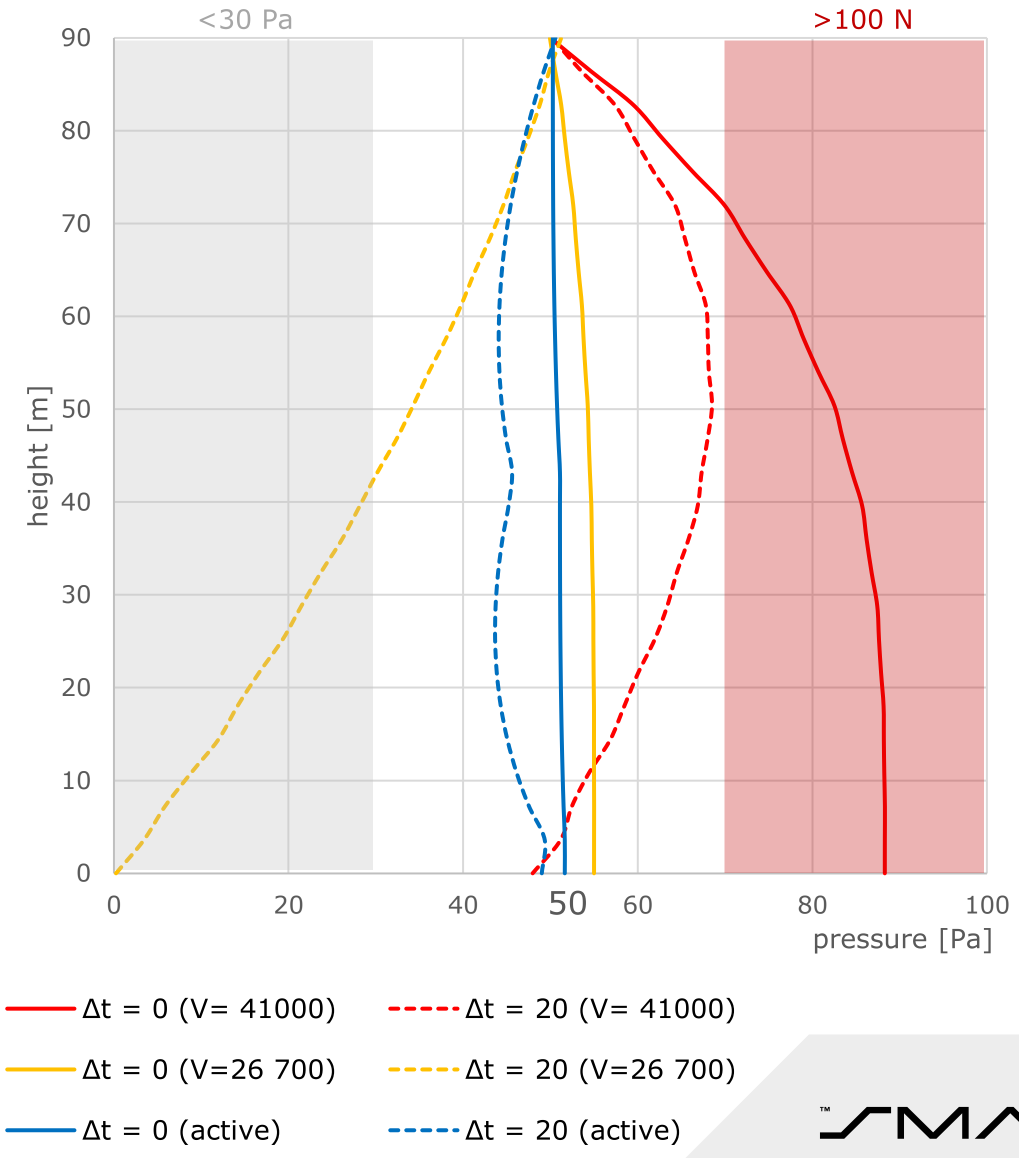
PRESSURE DISTRIBUTION
DIFFERENT PDS, 90m BUILDING



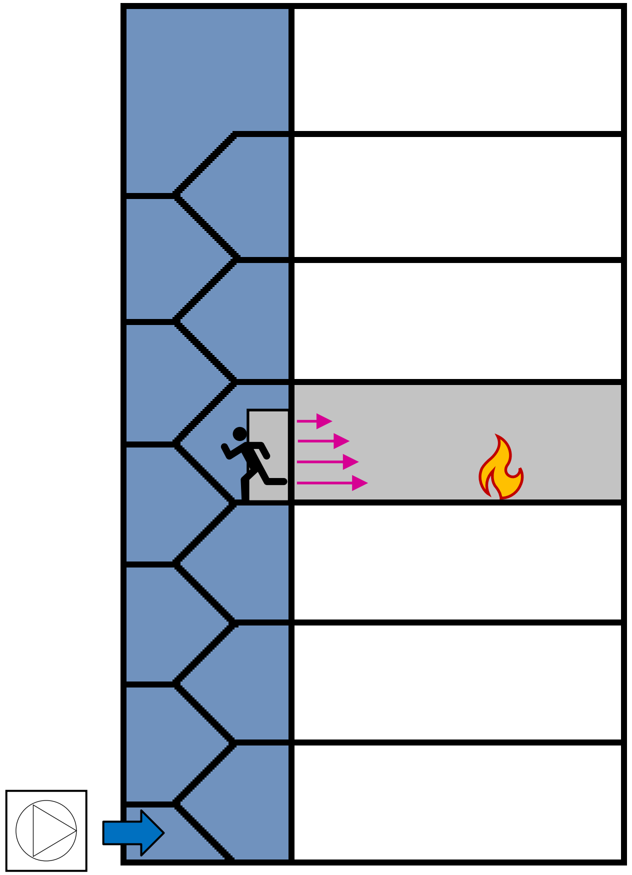
CONSTANT AIR VOLUME

V=26700 m³/h **V=41000 m³/h**

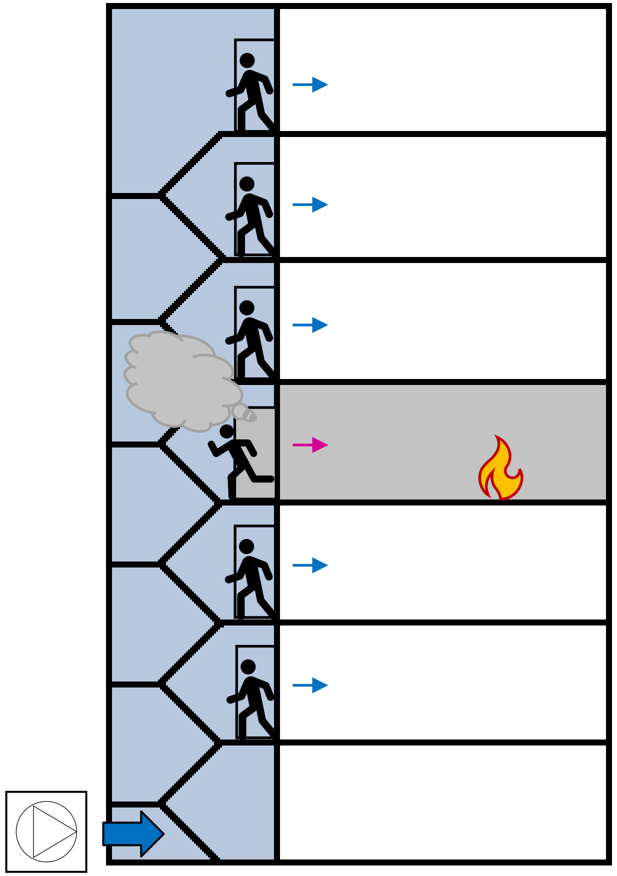
ADAPTIVE FLOW SYSTEM



WILL PRESSURISATION WORK
DURING **SIMULTANEOUS EVACUATION**?



STAIRCASE PROTECTED
ONE DOOR OPEN
6 Pa ➔ 2 m/s



STAIRCASE PROTECTED
ALL DOORS OPEN
0 Pa ➔ 0 m/s

WILL PRESSURISATION WORK
DURING **SIMULTANEOUS EVACUATION**?

4.4 Class C pressurization system

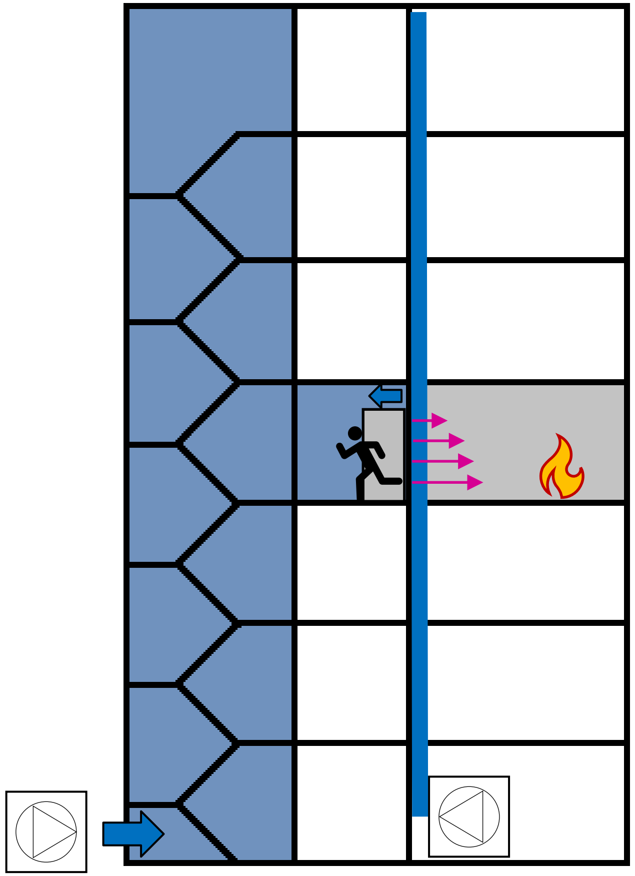
4.4.1 General

The design conditions for Class C systems are based on the assumption that the occupants of the building will all be evacuated on the activation of the fire alarm signal that is simultaneous evacuation.

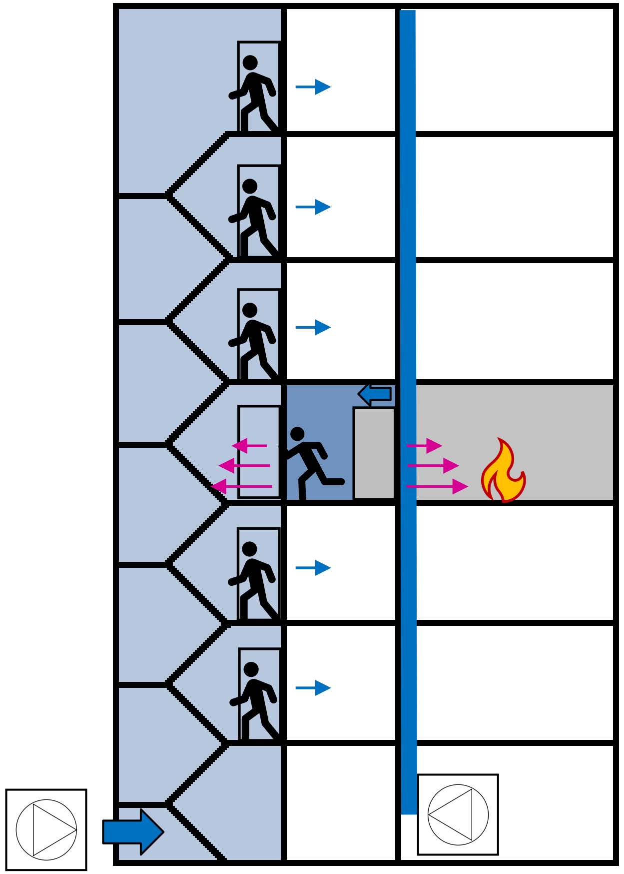
In the event of a simultaneous evacuation it is assumed that the stairways will be occupied for the nominal period of the evacuation, and thereafter will be clear of evacuees. Consequently, the evacuation will occur during the early stages of fire development, and some smoke leakage onto the stairway can be tolerated. The airflow due to the pressurization system shall clear the stairway of this smoke.

The occupants being evacuated are assumed to be alert and aware, and familiar with their surroundings, thus minimising the time they remain in the building.

WILL PRESSURISATION WORK
DURING **SIMULTANEOUS EVACUATION**?



LOBBY PROTECTED
ONE DOOR OPEN
6 Pa ➔ 2 m/s



LOBBY PROTECTED
ALL DOORS OPEN
1 m/s ← 1 Pa ➔ 1 m/s

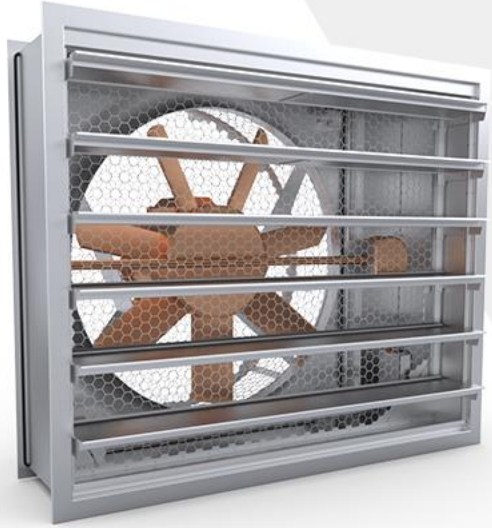
AVAILABLE RANGES:

Unit	$\dot{V}_{min}, m^3/h$	$\dot{V}_{max}, m^3/h$
iSWAY-FC	200	50500
iSWAY-FC-J	1500	75000
iSWAY-RFC	200	49500
iSWAY-WFC	200	42000

THANKS TO:

- PREDICTIVE ALGORITHM,
- FREQUENCY INVERTER,
- BRAKING RESISTOR.

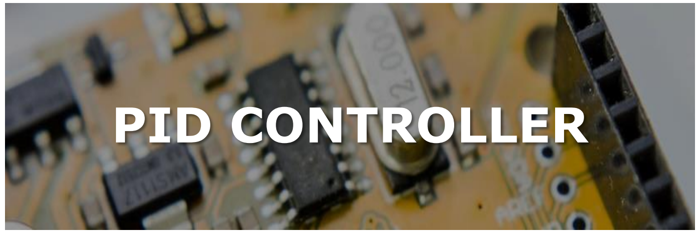
AVAILABLE TYPES:

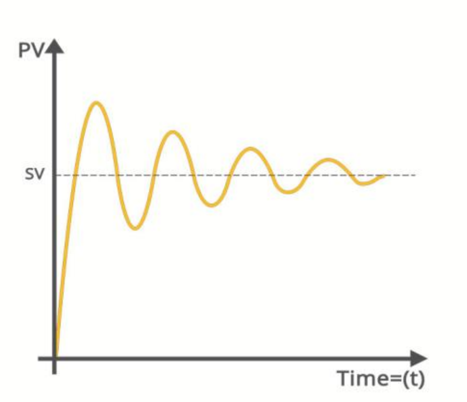


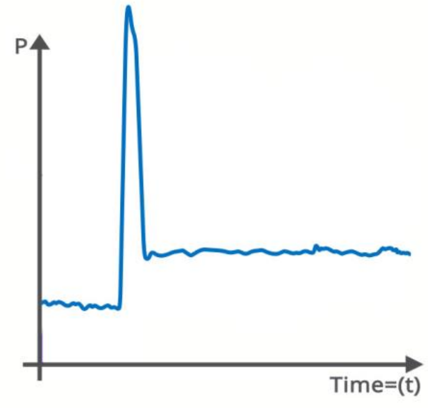
iSWAY-WFC®

iSWAY-RFC®

iSWAY-FC®







PID CONTROLLER
PRESSURE-BASED
CONTROL ONLY

EXAMPLE RANGES, m³/h:
1300 – 9000
15 000 – 55 000

PREDICTIVE-ADAPTIVE CONTROLLER
BASED ON NEURAL NETWORK

EXAMPLE RANGES, m³/h:
200 – 50 500
1500 – 75 000

SELF-TEST ABILITY

iSWAY makes a brief test of its funcionality every 24h:

- Cut-off damper is opened
- Fan starts operation at low frequency (for few secs)
- Data is collected and recorded in the device memory

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BENEFITS:

- Potential failure can be quickly identified and eliminated
- Reports can be easily printed
- Allows to reduce the duration of periodic inspections
- Reduce operating costs

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I.F.I.
AACHEN, GERMANY

BUILDING RESEARCH INSTITUTE
ITB
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SMAY CO-CREATES WARSAW SKYLINE

ALL STAGE SUPPORT

CONCEPT OF THE SYSTEM

TECHNICAL CONSULTING

CALCULATIONS

SELECTION OF EQUIPMENT

CFD &

MATHEMATICAL ANALYSIS

START-UP

COMMISSIONING SUPPORT

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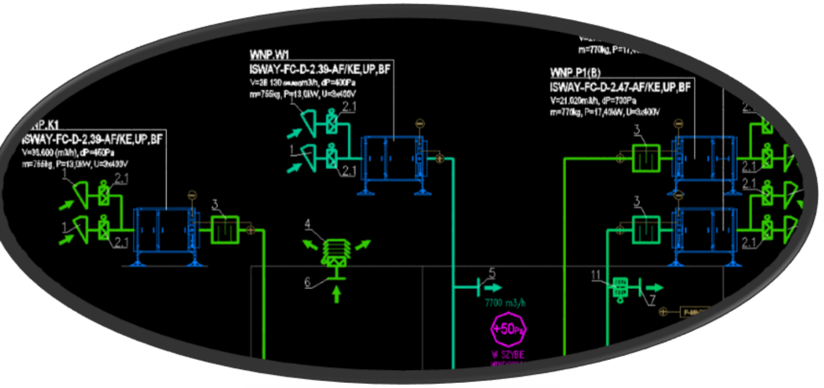
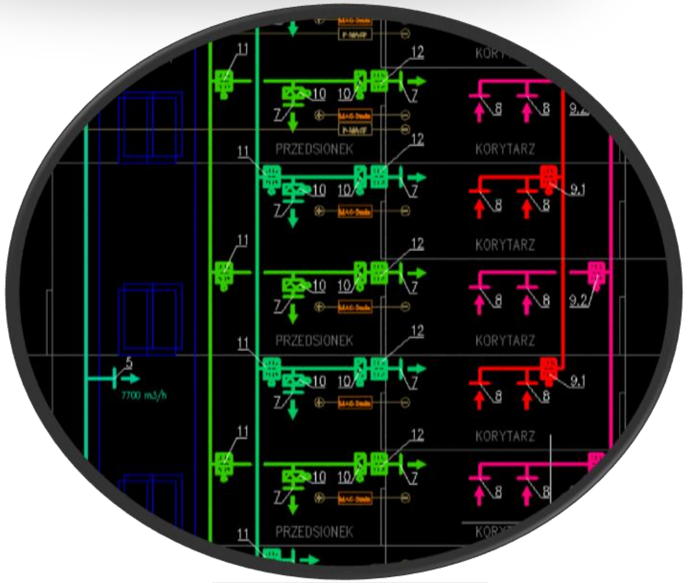
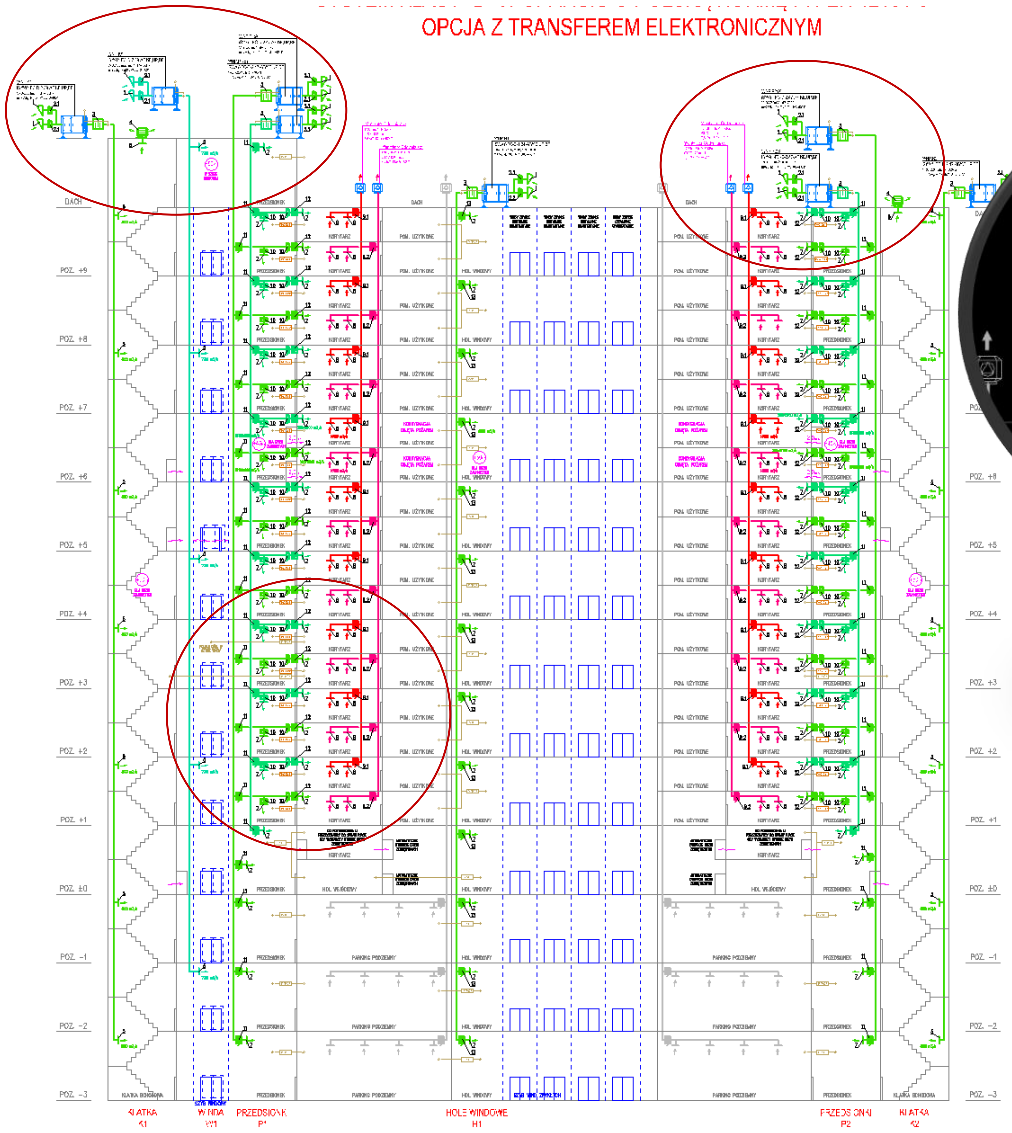
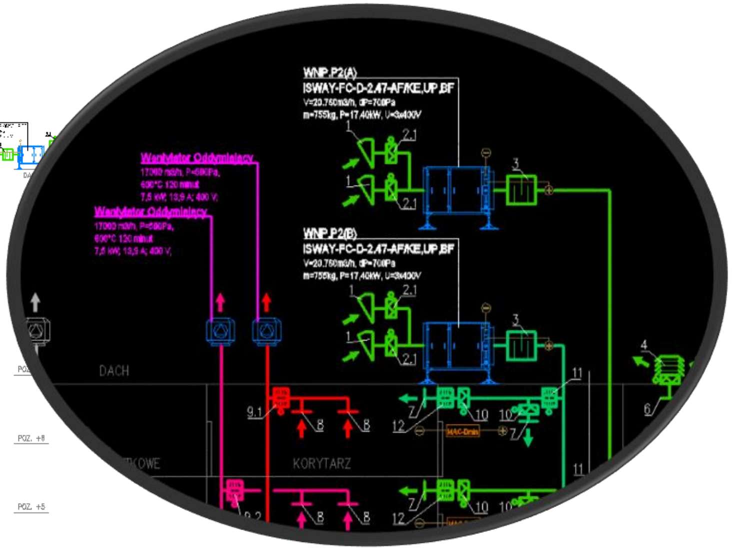
SUPPORT
CONCEPT OF SYSTEM









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Systems

SUPPORT
CALCULATIONS

STAIRCASE: C SYSTEM: C
2021-11-02

STAIRCASE C

OVERPRESSURE CRITERION	ΔP =	50	Pa					
Type of LEAK:				leakage unit:			air volume:	
- DOORS - single, opening to overpressure	n =	12	pcs.	A_E =	0,01	m^2	Q_D =	2 535 m^3/h
- DOORS - single, opening from overpressure	n =	1	pcs.	A_E =	0,02	m^2	Q_D =	423 m^3/h
- DOORS - double	n =	0	pcs.	A_E =	0,03	m^2	Q_D =	0 m^3/h
- LIFT SHAFT - doors to lift	n =	12	pcs.	A_d =	0,06	m^2	Q_{Ld} =	15 212 m^3/h
- CEILING and FLOOR	A_{FLOOR} =	90,0	m^2	A_{LF}/A_{WALL}	0,052	$\cdot 10^{-3}$	Q_{LF} =	99 m^3/h
- WALLS internal (average)	A_{WALL} =	1 045,0	m^2	A_{LW}/A_{WALL}	0,210	$\cdot 10^{-3}$	Q_{LW} =	4 637 m^3/h
- WALLS external (average)	A_{WALL} =	0,0	m^2	A_{LW}/A_{WALL}	0,110	$\cdot 10^{-3}$	Q_{LW} =	0 m^3/h
- WINDOWS (swing, with seal)	L =	0,0	m	A_{WINDOW}/L	0,036	$\cdot 10^{-3}$	Q_{WINDOW} =	0 m^3/h
- Other leakages				A =	0,00	m^2	Q_{OTHER} =	0 m^3/h
Summary LEAKAGES							Q_{DC} =	22 906 m^3/h
AMOUNT OF AIR THROUGH LEAKINESS with addition		addition:		d_{NN} =	50	%	Q =	34 360 m^3/h
TRANSFER		none		Anetto ≥	0,23	m^2	Q =	0 m^3/h
RELIEF ON ROOF		none		A =	-	m^2	Q =	0 m^3/h
AIR VOLUME FOR CRITERION ΔP = 50 Pa							Q_{S50} =	**34 360 m^3/h**
AIR VELOCITY CRITERION	W ≥	0,75	m/s					
OPEN DOORS ON FIRE LEVEL:	D_A =	2,26	m^2				Q_{DO} =	6 110 m^3/h
Air exhaust method		gravitational relief		pUP ≤	20	Pa	Awind ≥	0,48 m^2
Overpressure in stairway while opened doors				p =	21	Pa	Ashaft ≥	0,85 m^2
Type of LEAK:				leakage unit:			air volume:	
- DOORS - single, opening to overpressure	n =	11	pcs.	A_E =	0,01	m^2	Q_D =	1 500 m^3/h
- DOORS - single, opening from overpressure	n =	1	pcs.	A_E =	0,02	m^2	Q_D =	273 m^3/h
- DOORS - double	n =	0	pcs.	A_E =	0,03	m^2	Q_D =	0 m^3/h
- LIFT SHAFT - doors to lift	n =	12	pcs.	A_d =	0,06	m^2	Q_{Ld} =	9 816 m^3/h
- CEILING and FLOOR	A_{FLOOR} =	90,0	m^2	A_{LF}/A_{WALL}	0,052	$\cdot 10^{-3}$	Q_{LF} =	64 m^3/h
- WALLS internal (average)	A_{WALL} =	1 045,0	m^2	A_{LW}/A_{WALL}	0,21	$\cdot 10^{-3}$	Q_{LW} =	2 992 m^3/h
- WALLS external (average)	A_{WALL} =	0,0	m^2	A_{LW}/A_{WALL}	0,11	$\cdot 10^{-3}$	Q_{LW} =	0 m^3/h
- WINDOWS (swing, with seal)	L =	0,0	m	A_{WINDOW}/L	0,036	$\cdot 10^{-3}$	Q_{WINDOW} =	0 m^3/h
- Other leakages				A =	0,00	m^2	Q_{OTHER} =	0 m^3/h
Summary LEAKAGES							Q_{FR} =	14 650 m^3/h
OPEN DOORS on other floors (series flow)	D_A =	1,89	m^2	DA =	2,10	m^2	Q_{DO} =	0 m^3/h
OPEN DOORS on other floors (direct)	D_A =	1,89	m^2		2,10		Q_{DO} =	0 m^3/h
TRANSFER		none		Anetto ≥	0,23	m^2	Q =	0 m^3/h
RELIEF ON ROOF		none		A =	-	m^2	Q =	0 m^3/h
AIR VOLUME FOR CRITERION W ≥ 0,75 m/s							Q_{LOB} =	**20 760 m^3/h**
OVERPRESSURE CRITERION WITH OPEN DOOR	ΔP =	10	Pa					
Type of LEAK:				leakage unit:			air volume:	
- DOORS - single, opening to overpressure	n =	12	pcs.	A_E =	0,01	m^2	Q_D =	1 134 m^3/h
- DOORS - single, opening from overpressure	n =	0	pcs.	A_E =	0,02	m^2	Q_D =	0 m^3/h
- DOORS - double	n =	0	pcs.	A_E =	0,03	m^2	Q_D =	0 m^3/h
- LIFT SHAFT - doors to lift	n =	12	pcs.	A_d =	0,06	m^2	Q_{Ld} =	6 803 m^3/h
- CEILING and FLOOR	A_{FLOOR} =	90,0	m^2	A_{LF}/A_{WALL}	0,052	$\cdot 10^{-3}$	Q_{LF} =	44 m^3/h
- WALLS internal (average)	A_{WALL} =	1 045,0	m^2	A_{LW}/A_{WALL}	0,21	$\cdot 10^{-3}$	Q_{LW} =	2 074 m^3/h
- WALLS external (average)	A_{WALL} =	0,0	m^2	A_{LW}/A_{WALL}	0,11	$\cdot 10^{-3}$	Q_{LW} =	0 m^3/h
- WINDOWS (swing, with seal)	L =	0,0	m	A_{WINDOW}/L	0,036	$\cdot 10^{-3}$	Q_{WINDOW} =	0 m^3/h
- Other leakages				A =	0,00	m^2	Q_{OTHER} =	0 m^3/h
Summary LEAKAGES							Q_{DC} =	10 060 m^3/h
OPEN DOORS on other floors (direct)	D_A =	2,64	m^2		0,00		Q_{DO} =	24 950 m^3/h
OPEN DOORS on other floors (direct)	D_A =	1,89	m^2		2,10		Q_{DO} =	0 m^3/h
TRANSFER		none		Anetto ≥	0,23	m^2	Q =	0 m^3/h
RELIEF ON ROOF		none		A =	-	m^2	Q =	0 m^3/h
AIR VOLUME FOR CRITERION ΔP = 10 Pa							Q_{S10} =	**35 010 m^3/h**
FAN SELECTION								
Required air volume for the criterion ΔP = 50 Pa							Q_{S50} =	34 360 m^3/h
Required air volume for the criterion W ≥ 0,75 m/s							Q_{LOB} =	20 760 m^3/h
Required air volume for the criterion ΔP = 10 Pa							Q_{S10} =	35 010 m^3/h
Calculated air volume for stack effect elimination		don't include					Q_{CK} =	0 m^3/h
Safety factor		addition for leaks of ducts:		d_{NN} =	15	%		
TOTAL SUPPLY AIR VOLUME							Q_P =	**40 270 m^3/h**
Available pressure of the air supply fan							P_{FAN} =	408 Pa
SELECTED FAN		WP.C			iSWAY-FC-D- 2.31-J			

SMAY

SELECTION CARDS

2023-05-09

Pressurization unit: A.E(floor).6-L2
Protected space: firefighting lobby

iSWAY-FC-D-2.47-AF-Z/KE,SS,UP

The iSWAY-FC® unit series is designed to create a specified value of overpressure in a staircase space, fire-fighting vestibule, fire-fighting elevator shaft, or other space covered by a pressure differential system. They can be located in the machine room on any floor, on the roof or next to the building at ground level.

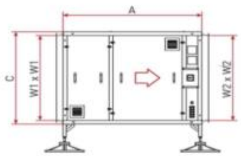
TYPE AND SIZE

Type	iSWAY-FC-D
Size	2.47
Operating direction	supply
Location	outside the building
Operating side	-

iSWAY-FC-D pressurisation unit

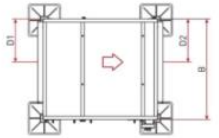
DEVICE PARAMETERS

Fan capacity	V =	16 800	m^3/h
Static pressure	ΔP =	1100	Pa
Active power	P =	17,40	kW
Apparent power	S =	17,75	kVA
Supply voltage	U =	3x 400	V
Sound power level	Lwa =	95	dB(A)
Total weight	m =	571	kg



BASIC EQUIPMENT

- Inverter controlled fan
- Automation cabinet (with inverter, regulator, 24 VDC power supply)
- Shut-off damper with servomotor
- Smoke detector;
- Housing insulated with sandwich slabs;
- Main switch;
- Braking resistor.



ADDITIONAL EQUIPMENT

- Additional outputs 24V DC	-
- Additional pressure sensor	-
- Suction-side connection	KE - flexible connector
- Support system	SS - welded feet
- Dual intake system	SRC multi-blade dampers
- Air volume measurement	-
- Anti-Frost system	infrared heater
- Roof	-

iSWAY-FC-D DIMENSIONS

Width:	B =	1520	mm
Height:	C =	1300	mm
Length:	A =	1720	mm
Connectors size:	W1,W2 =	1200x1200	mm
Connect. length:	D1,D2 =	650	mm

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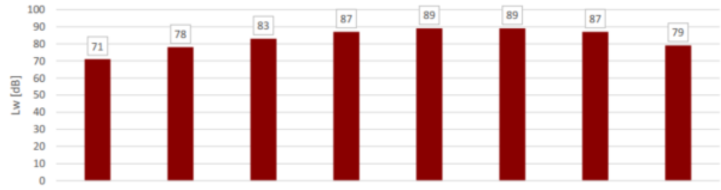
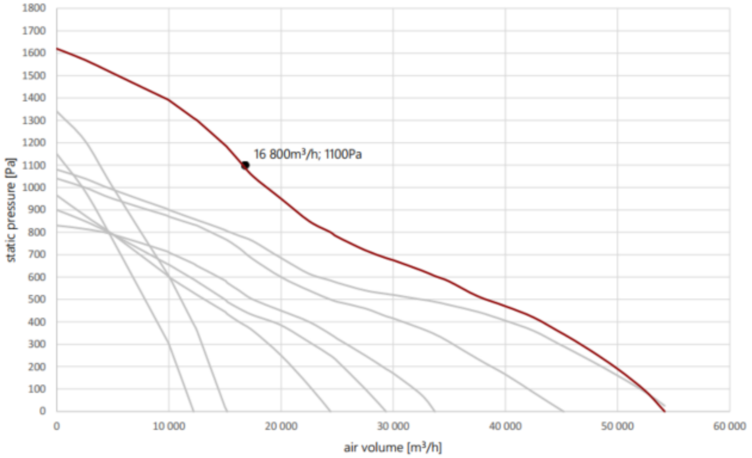
ACOUSTIC DATA



Sound power level in frequency bands, Lw [dB]

OPERATING POINT



The operating point for type iSWAY-FC-D-2.47 unit with A.E(floor).6-L2 symbol serving: the firefighting lobby.
The unit characteristics show the dependence of the flow rate on the available compression (taking into account the pressure loss of the shut-off damper and the unit-mounted air intake).

DOCUMENTATION:

https://www.smay.pl/en/product/isway-fc-compact-unit-for-pressure-differential-systems/

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SUPPORT
ADDITIONAL MATHEMATICAL ANALYSIS

SMAY Sp. z o.o.
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30-003 Podłęże,
POLAND

VAT UE: PL6782821888

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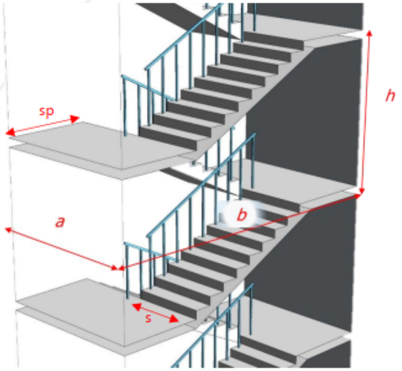
DESCRIPTION AND ASSUMPTIONS FOR ANALYSIS:

- **Goal of the analysis**: determination of pressure distribution in the staircase during the operation of the pressure differentiation system
- Height of the staircase: 87,5 m (82,4 m above ground and 5,1 m underground)
- Tightness level: average in accordance to EN 12101-6
- Method of analysis: analytical calculations of pressure inside the staircase taking into account the stack effect, flow resistance, leakage
- All doors are closed
- The correct operation of the pressure differential system (PDS) requires pressure regulation within the corridors, which was not the subject of the analysis
- Location of air supply points:
  - Reversible top iSWAY unit: L23
  - Additional iSWAY unit: L06, L08, L10, L12, L14, L16, L18, L20
  - Reversible bottom iSWAY unit: LGround, L02, L04,
- the analysis was performed for summer, isothermal and winter conditions
- staircase geometry:
  - a = 3,0 m
  - b = 5,25 m
  - sp = 1,425 m
  - s = 1,40 m
  - h = 3,25 ÷ 4,11 m (above ground)
  - h = 2,95 ÷ 4,32 m (underground)



RESULTS OF THE ANALYSIS:

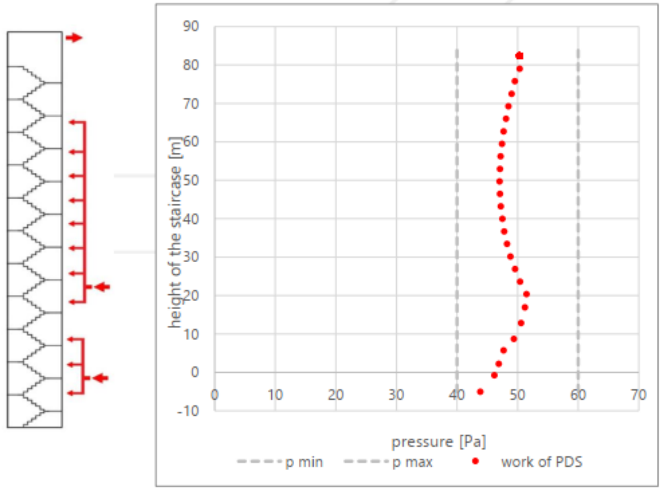
Winter conditions

Pressure differences between staircase and outside

Temperature **outside** in winter	T_{out}	0	[°C]
Temperature **inside** in winter	T_{inn}	18	[°C]

Outlet volume flow (top)	V_{out}	- 12 600	[m³/h]
Additional volume flow (middle)	V_{add}	5 000	[m³/h]
Inlet volume flow (down)	V_{inn}	21 200	[m³/h]

Figure 01. Pressure differences between staircase and outside due to work of Pressure Differential System (PDS) in winter conditions



SUPPORT
ADDITIONAL MATHEMATICAL ANALYSIS

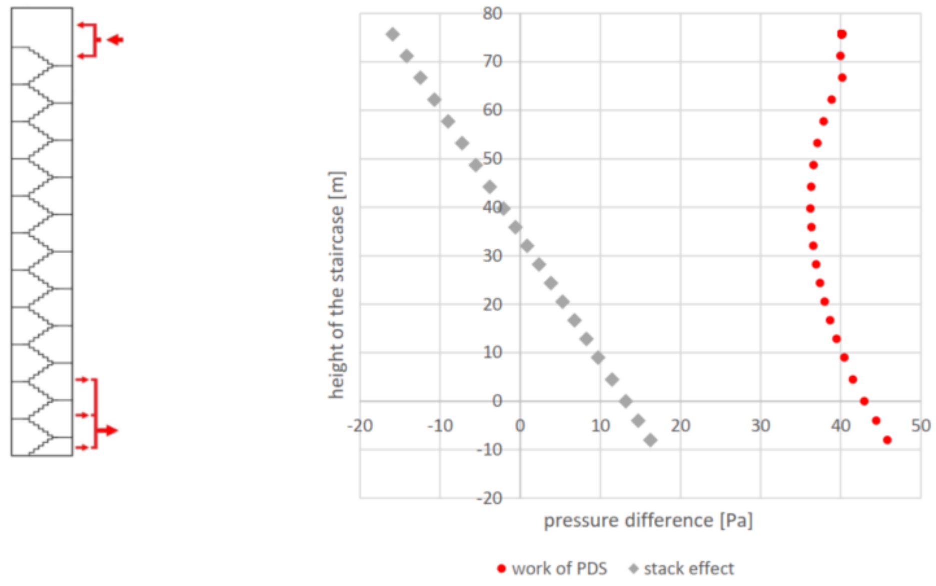
Summer conditions - staircase

Pressure differences between staircase and outside

Temperature **outside** in summer	$T_{out,s}$	32	[°C]
Temperature **inside** in summer	$T_{ins,s}$	22	[°C]

Outlet volume flow (down)	V_{out}	-9 700	[m³/h]
Inlet volume flow (top)	V_{inn}	40 000	[m³/h]

Figure 03. Pressure differences between staircase and outside due to stack effect and due to work of Pressure Differential System (PDS) in summer conditions



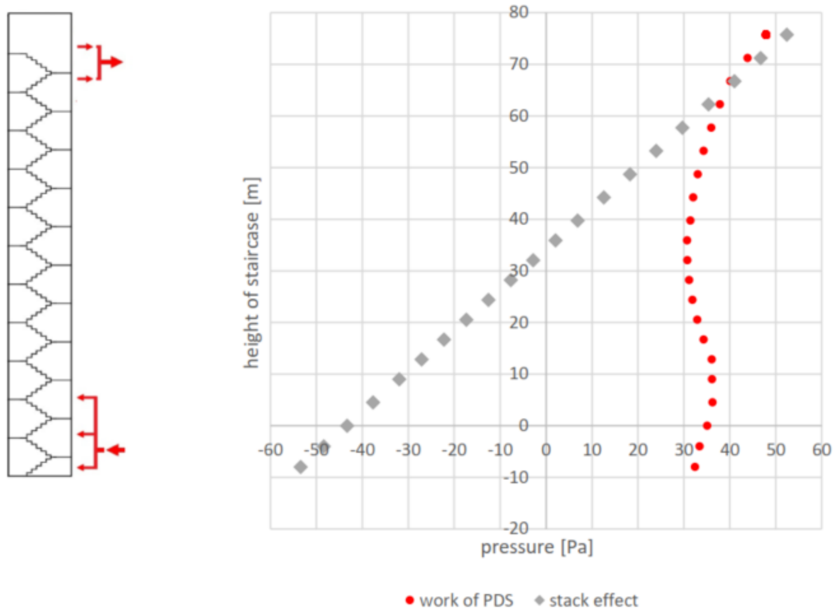
Winter conditions - staircase

Pressure differences between staircase and outside

Temperature **outside** in winter	$T_{out,w}$	-10	[°C]
Temperature **inside** in winter	$T_{ins,w}$	18	[°C]

Outlet volume flow (top)	V_{out}	-32 500	[m³/h]
Inlet volume flow (down)	V_{inn}	61 000	[m³/h]

Figure 02. Pressure differences between staircase and outside due to stack effect and due to work of Pressure Differential System (PDS) in winter conditions



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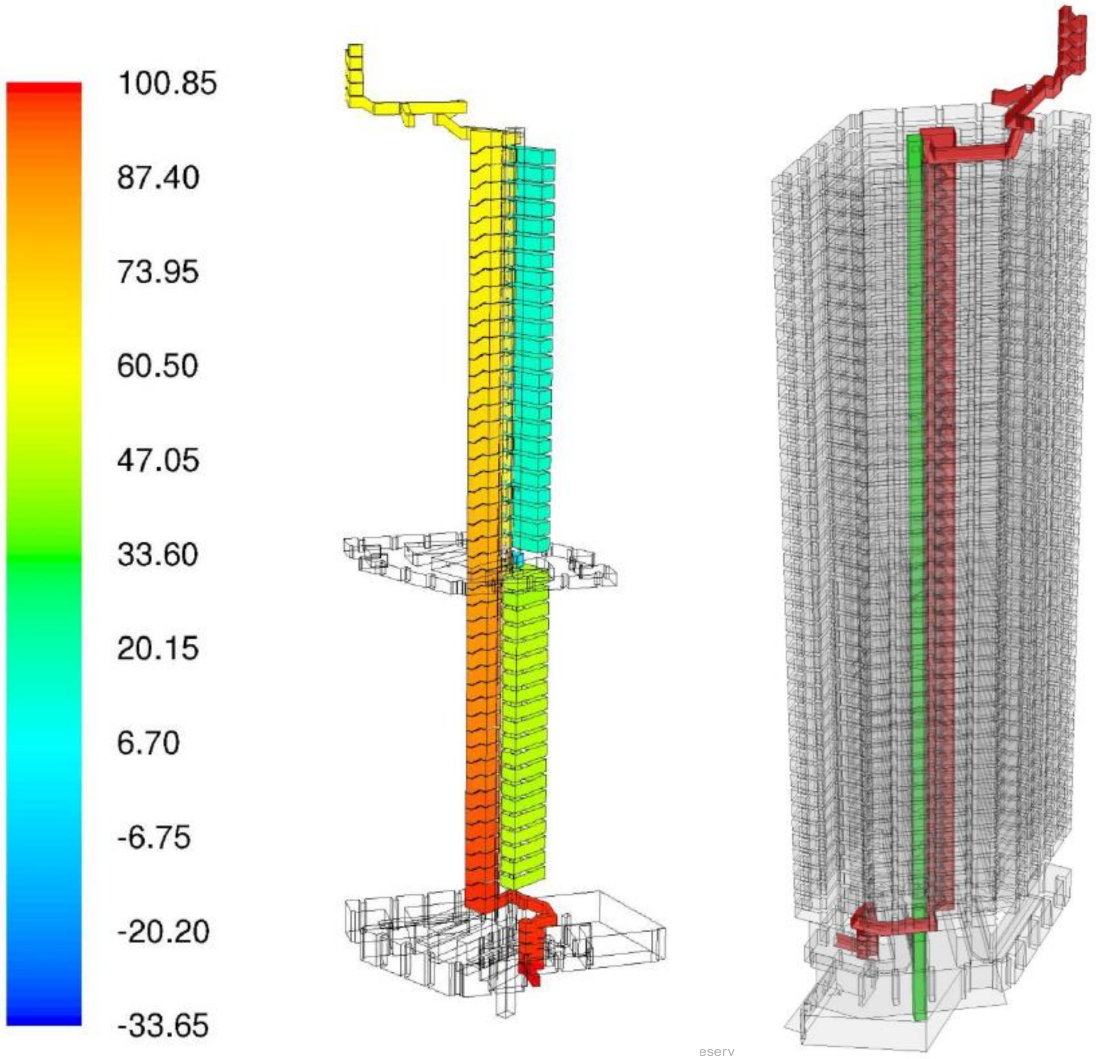
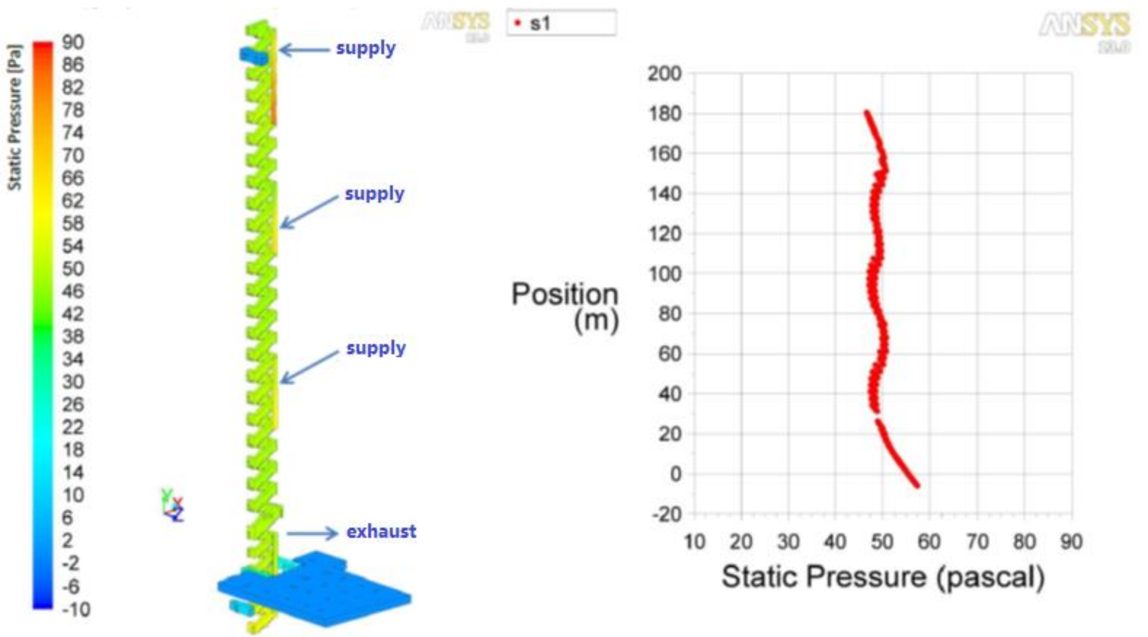
CFD SIMULATIONS





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SPECIFICATION

Symbol	Type	Description	Qty
PRESSURE DIFFERENTIAL SYSTEM			
	REVERSIBLE SAFETY WAY SYSTEM	SAFETY WAY PRESSURE DIFFERENTIAL SYSTEM WITH REVERSIBLE UNITS for space pressurization according to design criteria, with stack effect counteracting in high-rise buildings. Certified complete system including all units and accessories. Meets all the requirements of Standard EN 12101-6 as a smoke prevention system. The reversible Safety Way system is protected under the PATENTS PL218694 "System of positive pressure protection of vertical escape routes" and PL218095 "Method of pressure regulation in vertical escape routes". The devices provide 90% of nominal capacity in less than 3 seconds, at any pressure change. Communication and control of the units in a bidirectional loop ensuring full operation of the system and all fans with a single wiring fault. Optional dual pressure measurement system to ensure full system operation with a single pressure sensor failure. System provides automatic 24-hour testing to verify system and fan readiness every 24 hours on a programmable schedule.	1
EQUIPMENT FOR STAIRCASES			
S-A_T	**iSWAY-FC-R-2.31-J-AF-Z / KE, UP, BF**	REVERSIBLE PRESSURIZATION UNIT for outdoor installation, with right-side service access. The unit has all components built and fully wired in a compact housing. It ensures pressure generation and regulation by continuous measurement and by changing the fan capacity by means of a frequency converter. Equipment: fan with variable output, insulated housing with inspection panel, shut-off damper with actuator, automation cabinet with frequency converter, controller and 24V DC power supply, braking resistor, smoke detector and differential pressure sensor in the device, anti-freeze damper system, a pair of dampers with actuators for double inlet system, two flexible inlet and outlet connectors, BigFoot supports, main switch. Parameters: Capacity 1500÷36000 m3/h (88% of capacity in reverse), available pressure 260 Pa (for max airflow), active electric power 9,22 kW, supply voltage 3x 400 V, weight 412 kg, dimensions BxCxA= 1520x1300x1720 mm.	2
S-A_B	**iSWAY-FC-R-2.47-J-AF / KE, KM**	REVERSIBLE PRESSURIZATION UNIT for indoor installation, with right-side service access. The unit has all components built and fully wired in a compact housing. It ensures pressure generation and regulation by continuous measurement and by changing the fan capacity by means of a frequency converter. Equipment: fan with variable output, insulated housing with inspection panel, shut-off damper with actuator, automation cabinet with frequency converter, controller and 24V DC power supply, braking resistor, smoke detector and differential pressure sensor in the device, anti-freeze damper system, two flexible inlet and outlet connectors, mounting brackets, main switch. Parameters: Capacity 1500÷46000 m3/h (88% of capacity in reverse), available pressure 316 Pa (for max airflow), active electric power 17,4 kW, supply voltage 3x 400 V, weight 515 kg, dimensions BxCxA= 1520x1300x1720 mm.	2

S-B	**iSWAY-FC-D-2.31-J-AF / KE, KM**	PRESSURIZATION UNIT for indoor installation, with right-side service access. The unit has all components built and fully wired in a compact housing. It ensures pressure generation and regulation by continuous measurement and by changing the fan capacity by means of a frequency converter. Equipment: fan with variable output, insulated housing with inspection panel, shut-off damper with actuator, automation cabinet with frequency converter, controller and 24V DC power supply, braking resistor, smoke detector and differential pressure sensor in the device, anti-freeze damper system, two flexible inlet and outlet connectors, mounting brackets, main switch.Parameters: Capacity 1500÷29400 m3/h, available pressure 506 Pa (for max flow), active electric power 9,22 kW, supply voltage 3x 400 V, weight 412 kg, dimensions BxCxA= 1520x1300x1720 mm.	1
PRESSURIZATION SYSTEM ACCESSORIES			
	P-MACF	PRESSURE DIFFERENCE SENSOR, with LEDs indicating operating status. Pressure range 0÷500Pa, power supply 24V DC, protection degree IP54, operating temperature -25÷55°C	5
	T-MACF	TEMPERATURE SENSOR, with LEDs indicating operating status. Measurement range -25÷55°C, power supply 24V DC, protection degree IP65, operating temperature -25÷55°C, measurement error ±2,5°C.	8
	KWR-1205x1205-	COMPACT EXHAUST VENT including roof outlet type B, damper with 3 actuators, digital regulator with a differential pressure sensor, roof base. Dimensions AxBxH= 1205x1205x1210+ mm.	1
AUTOMATION COMPONENTS			
	TSS-5	INDICATOR-SIGNAL BOARD with display, for 5 iSWAY unit Degree of protection IP65, key-operated security switch, dimensions SxWxG= 313x640x188 mm.	1
	Start-up	COMMISSIONING OF THE PRESSURIZATION SYSTEM Commissioning of equipment, measurement of required design criteria and calibration of the pressure differential	1

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TECHNICAL DESCRIPTION

1. **Reference standard**

Subject pressure differential system (PDS) *heat control systems. Specification for pre* knowledge has been applied.

2. **Design objectives and assumpti**

2.1. Design objectives

Major design objective is to keep vertical means of escape and facilitate firefighting

Secondary design objective is to provide system) serving as mechanical air release

2.2. Design assumptions

- stairwells ST1 and ST2 (over- and
  - design pressure difference in t
  - design airflow velocity from th
  - maximum door opening force
- firefighting lobbies FL1 and FL2 (o
  - design pressure difference in t
  - design airflow velocity from th
  - maximum door opening force

Note: it is assumed that only lobbies at th

3. Fire scenario

It is assumed that:

- building is fitted with an automati pressure differential system (PDS) one storey only at the time),

In case of a fire:

- stairwells are pressurized (overgro

Note: it is necessary to pressurize bo simultaneously regardless of the fire loca

- firefighting lobbies only at the ove
- smoke extraction from the corrido
- passenger lifts are automatically b
- evacuation will be carried out as p separately),
- capacities of the pressure differen in the stairwell can be open at the
- design parameters of the pressure moment when system has been tr

4. Overall description of the pressure

Note: Entire pressure differential system systems and certified in accordance wit performance, reliability and durability of one supplier (one responsible party).

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4.1. List of key components of the pressure differential system (PDS)

4.1.1. Pressure differential kits type SMAY iSWAY-FC® (CE in accordance with prEN 12101-6),

Use: pressurization of the stairwells, lobbies and lift shafts, compensation of the corridors

Kit of predefined components enclosed in single self-carrying thermally insulated casing with air supply fan, frequency inverter, pressure regulator, pressure differential sensor, breaking resistor, battery power supply, ducted smoke detector. Confirmed response time (<3 s within the range of airflows from 200 up to 50 500 m^3/h), reliability 10 000 cycles, durability and immunity to oscillations.

List of key components:

1 - Casing (steel sheet insulated with PIR foam)

2 - Infrared heater AF (option).

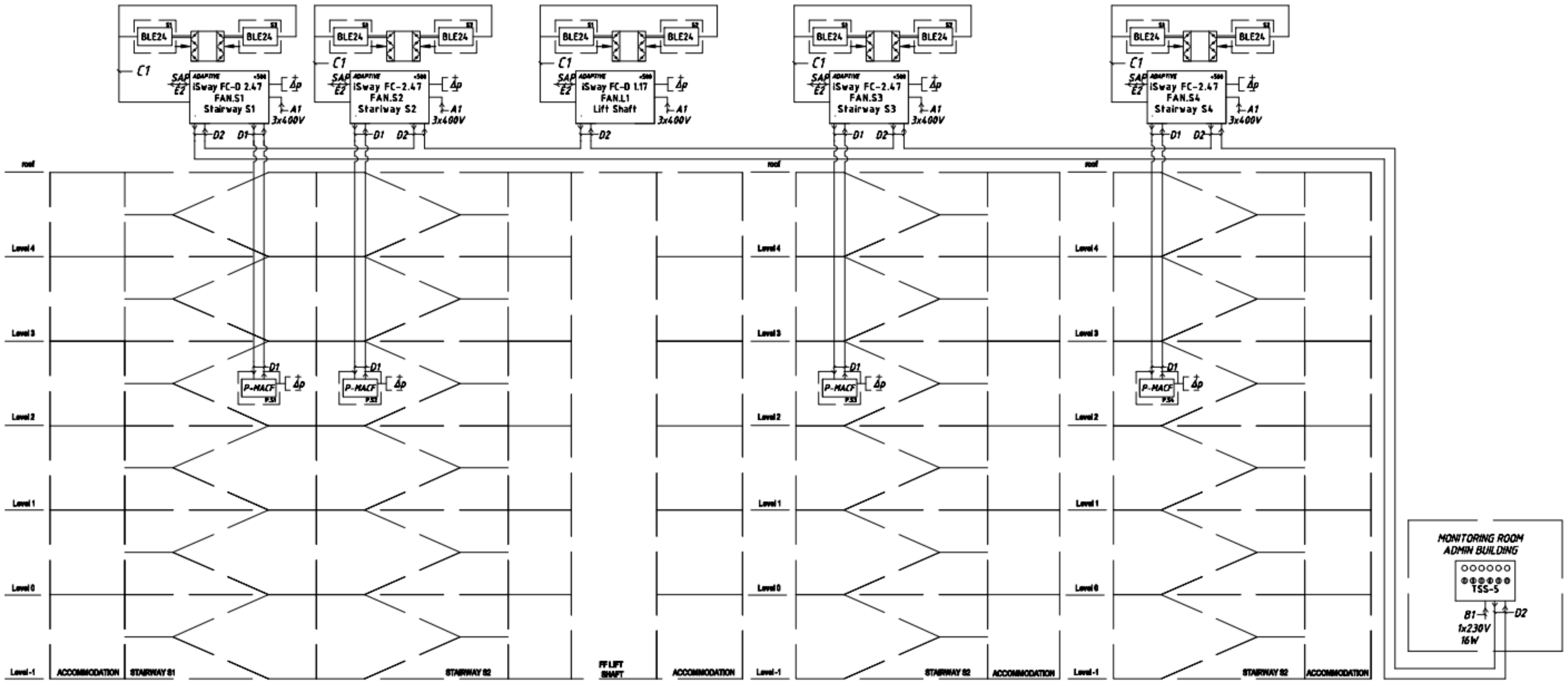
3 - Airflow measurement probe

4 – Axial fan

5 - Breaking resistor

6 - Shut-off damper (air intake)

SUPPORT
ELECTRICAL GUIDELINES



WIRING		
Designation in Scheme	Connections of automation's components	Cable type
A1	Guaranterd supply line 3x400V for iSWAY FC	TABLE 2
B1	Guaranted supply line 1x230VAC MSPU, TS, TSS	NHXH FE180/PH90 3x1,5
C1	Power/control cable 24VDC (double air intake)	HDGs FE180/PH90 3x1,5 mm²
D1	Local FireBus loop	HTKSH FE180/PH90 ekw 2x2x0,8
D2	Global FireBus loop	HTKSH FE180/PH90 ekw 2x2x0,8
E2	Cable. Fire alarm (FAS) (NC, parameterization required with two 4k7 resistors in a configuration in accordance with the DTR) Confirmation of work (NO) Failure (NC)	HTKSH FE180/PH90 3x2x0,8

The dimensions of automation's components SAFETY WAY SMAY	
Device	Dimension DxHxS (mm)
TSS-5	313x640x188
P-MACF	180x122x90

TABELE 1 Power and overcurrent protection circuit in device and in distribution board for equipment							TABLE 2 Cable A1
Device	Active power P[kW]	Apparent power S[kVA]	cos φ	λ	Overcurrent protection circuit in equipment	Required overcurrent protection circuit in distribution board	Cross section
iSWAY FC 1.17	5,26	5,36	0,98	0,9	B 16A	gG 20A	NHXH FE180/PH90 5x4 mm²
iSWAY FC 2.47	17,40	17,75	0,98	0,9	B 40A	gG 50A	NHXH FE180/PH90 5x16 mm²

Operation panel	Active power P[W]	Apparent power S[VA]	Overcurrent protection circuit in equipment	Required overcurrent protection circuit in distribution board
TSS-5	16	20	1,25 time delay	B6

Important note:

1. Power supply out of scope SMAY sp. z o.o. (guaranteed 24 VDC, 230VAC, 3x400VAC)
2. Low- and high-current installation out of scope SMAY sp. z o.o.
3. Power cables and control cables raceways performed as E90
4. Additional steering of actuators controlling doors, windows, skylights, smoke dampers, fire dampers and transfer dampers out of scope SMAY sp. z o.o.
5. Power, control and monitoring cables:
   - assumed that length of power supply cables (3x400VAC) is less than 70m while 20% of that length might be threatened by fire at once and voltage drop is less than 3%. For other conditions it is necessary to calculate size of the cables again.
   - assumed that length of power supply cables (1x230VAC) is less than 60m while 20% of that length might be threatened by fire at once and voltage drop is less than 5%. For other conditions it is necessary to calculate size of the cables again.
   - assumed that length of power supply cables (1x24VAC) for MAC-D-MIN controllers, and PZ boxes (C2-C6) is less than 40m while 20% of that length might be threatened by fire at once and voltage drop is less than 10%. For other conditions it is necessary to calculate size of the cables again.
   - assumed that length of power supply cables (1x24VAC) for P-MACF sensors, is less than 100m while 20% of that length might be threatened by fire at once and voltage drop is less than 10%. For other conditions it is necessary to calculate size of the cables again.
   - length of bus communication loop cannot exceed 250m between devices.
   - length of F2 and F7 cable together should not exceed 50m while 20% of that length might be threatened by fire at once. For other conditions it is necessary to calculate size of the cables again.
   - bus communication loop wires must be laid in a least 0,4m interspace from power cables (230VAC, 400VAC)

6. Static pressure measurement points located in air supply ductwork or protected spaces and ambient pressure measurement points shall be defined in mechanical design. The way of performing measurement points and leading of pulse tubes according to SMAY guidelines. Pneumatic signals „Δp" lead to iSWAY-FC type devices, P-MACF sensors and MAC-D-MIN controllers according to mechanical design guidelines.
7. Pneumatic installation (wires, pulse tubes, measurement points, connections) out of scope SMAY sp. z o.o.
8. TSS, TS, MSPU shall be located nearby the entrance of the building, on the fire and rescue brigades access level.
9. ŻUBR power supplies, if they are located at the schematic diagram, are powering only smoke exhaust fans located on the schematic diagram.
10. ŻUBR power supplies for smoke exhaust fans, shall be installed in fire separated technical rooms (indoor versions) or on the roof nearby the powered fans (outdoor versions).
11. MAC-D-MIN controller, P-MACF pressure transducer shall be mounted within the protected space (lobby, staircase, elevator duct).
12. Grounding of MAC-D-MIN and P-MACF shall be made with use of wiring from the casing of the power supply to the grounding point inside the device.
13. It is required to use separate overcurrent protection (short-circuit) for each of power supply outputs. This applies to every power supply line (24VDC, 230VAC and 3x400VAC. Overcurrent protection shall be mounted directly after the power supply branching point. It is required to ensure the selectivity of used protection.
14. This drawing is not a design according to law and it cannot be used as a substitute of the appropriate design - it is a guideline for electric and control design of SAFETY WAY/iSWAY
15. If required, manufacturer reserves the right to introduce all necessary changes both in the components and comlete systems.
16. It is highly recommended to contact the manufacturer or it's official representative at the conceptual design stage in order to execute the design

SAVE THE DATE:

15/06/2023

SMAY.PL/PDS

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FOR MORE

VISIT US AT THE STAND

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