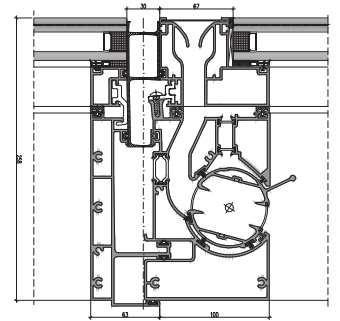
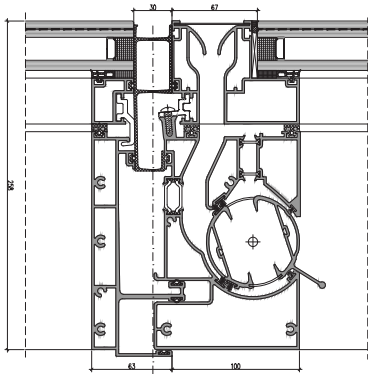


# TRICKLE VENT

Integrated Curtain Wall Natural Ventilation System



The Trickle Vent system has superior performance in aesthetics, function, cost, comfort, and laboratory performance.



# TRICKLE VENT Integrated Curtain Wall Natural Ventilation System



Torun Tower / İstanbul



Trickle Vent System view from inside

The air quality of indoor spaces is the most determinant consideration of a healthy working environment for office buildings. Low indoor quality leads to **Sick Building Syndrome**, which might be one of the major reasons for labor loss in office environments.

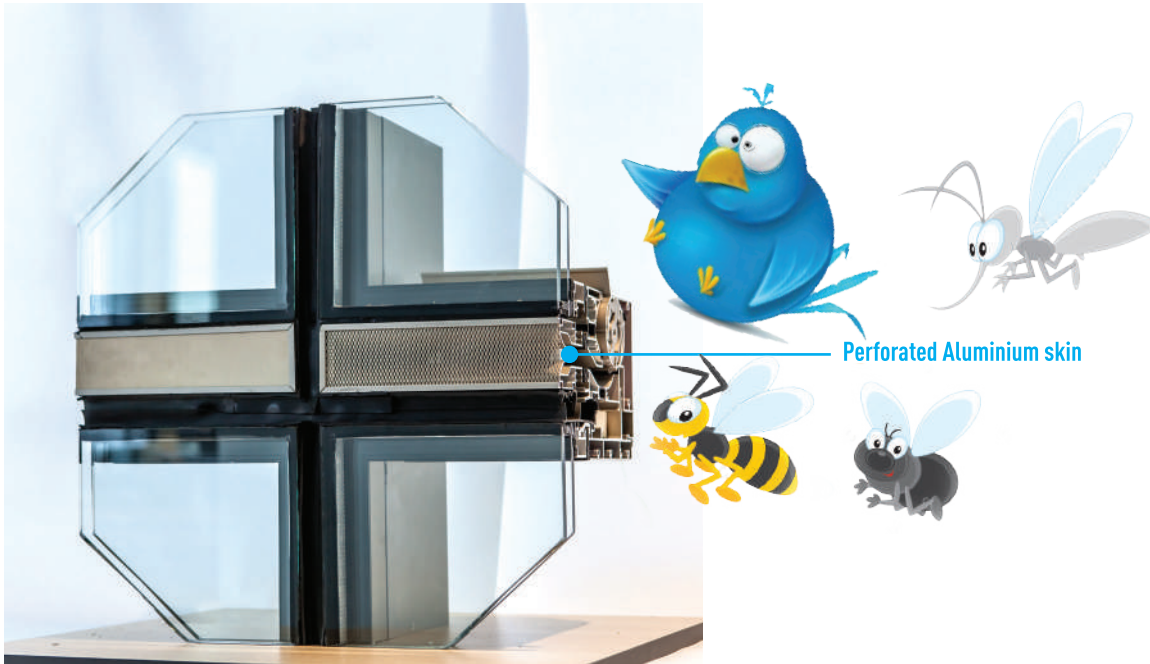
There are basically three types of ventilation to satisfy indoor air quality;

- Natural Ventilation,
- Mechanical (Forced) Ventilation
- Infiltration

Natural ventilation is an exchange of dirty indoor air with clean outdoor air due to pressure differences. Trickle Vent developed by METAL YAPI is a natural ventilation system, which is integrated into the façade system. It transfers the air from outdoor to indoor with an innovative valve system, which has variable operating positions in addition to simple open and closed positions in order to control and manage the air inlet quantity. Trickle Vent utilizes a perforated aluminum screen on the supply side of the system to prevent insects and bird passage from outside.

# TRICKLE VENT Integrated Curtain Wall Natural Ventilation System

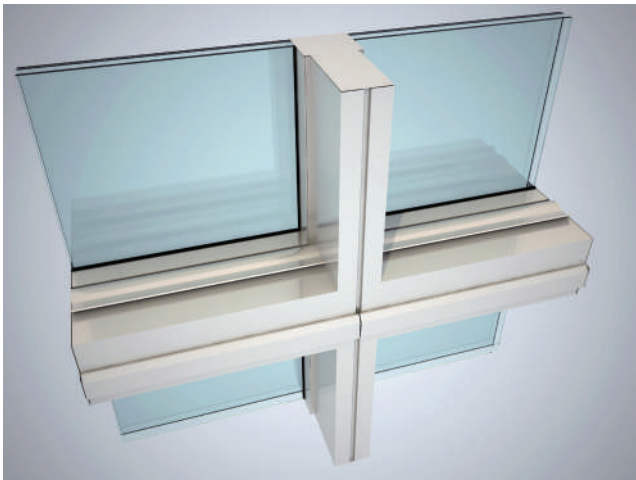
Trickle Vent utilizes a perforated aluminum screen on the supply side of the system to prevent insects and bird passage from outside.



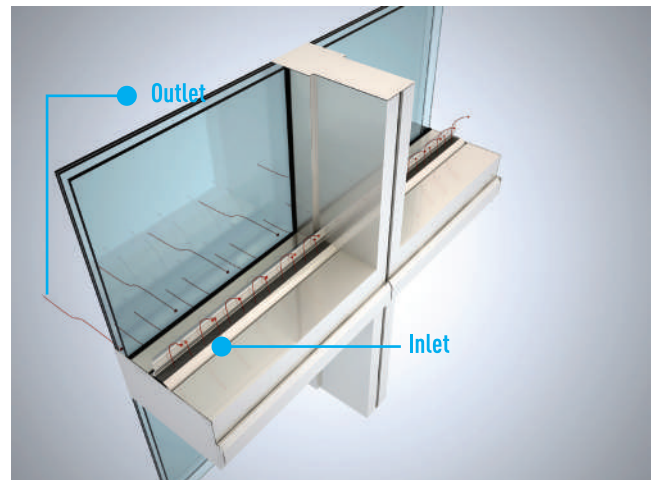
Trickle Vent System mock up

Besides, the unique aerodynamic and acoustical design of the system reduces external noise in both open and closed positions. This system also eliminates whistling noises. Moreover, Trickle Vent works harmoniously with building automation system. Therefore, indoor air quality is controlled in an energy efficient way and required optimum thermal comfort conditions are satisfied thanks to this high-tech system.

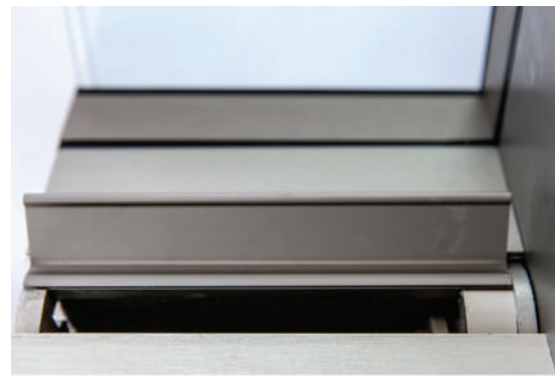
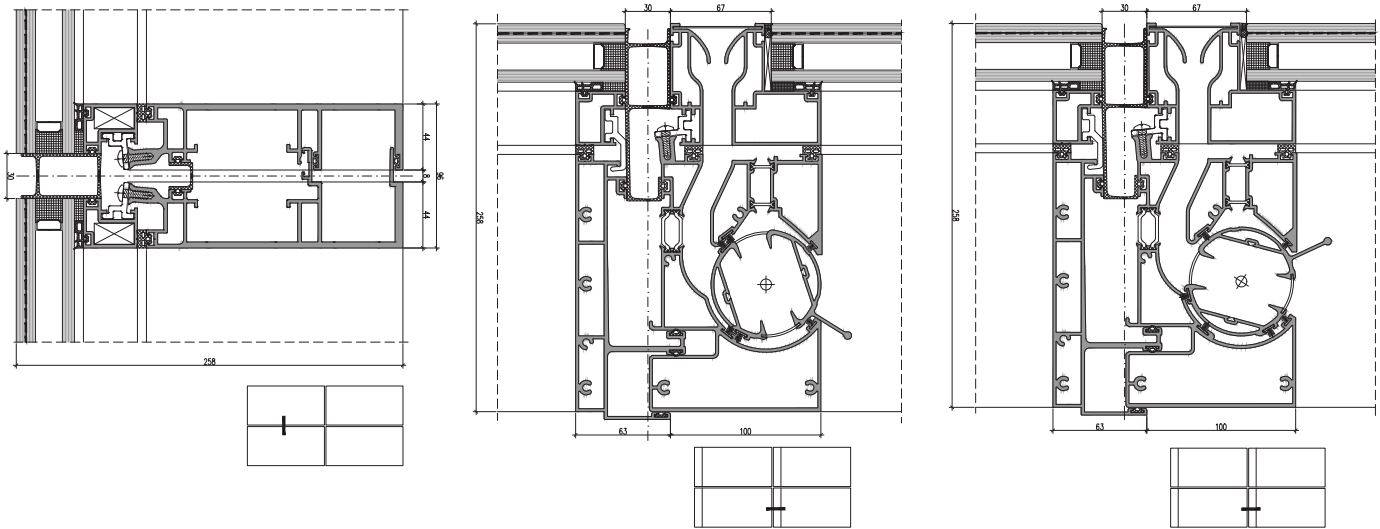
Furthermore; connecting Trickle Vent into building automation system enables controlled air intake and air discharge with respect to indoor air quality thanks to its energy efficient design.



Trickle Vent natural ventilation flaps



# TRICKLE VENT Integrated Curtain Wall Natural Ventilation System



Trickle Vent supplies mechanical ventilation comfort by means of natural ventilation methodology. From this point of view, advantages provided by the Trickle Vent system have been listed below:

- Eliminates secondary horizontal facade elements to ensure continuity of the façade.
- The minimum level of pressure difference (1Pa) supply sufficient fresh air for one person with only a meter Trickle Vent.
- The one-meter system on an average day can meet the fresh air needs of five people in fitness room,
- Due to the special aerodynamic design, Trickle Vent system supplies non-turbulent fresh air that will not disturb occupants.
- The aeroacoustical design of the system provides 25.8 dB acoustical performance in the open position.
- The Trickle Vent system can be opened in situations where wind speed is more than 8.3 m/s (30 km/h) : a condition not allowed by building automation systems with typical sash operated vents.
- Night cooling affect to indoor environment.



# TRICKLE VENT Integrated Curtain Wall Natural Ventilation System

- Condensation-free system components
- Excellent Thermal Performance -  $U_w = 0.8 \text{ W/m}^2\text{K}$  by using triple glass;  $U_w = 1.3 \text{ W/m}^2\text{K}$  by using double glass
- Providing controlled and energy efficient natural ventilation by connecting Trickle Vent to building automation system.
- Cost reduction in total ventilation system investment.
- Operating cost is almost zero - Can be easily removed for cleaning by end-user.
- Improved indoor air quality.
- Reduction of greenhouse gas emissions.
- Can easily be controlled by user.
- Energy savings.
- Significant decrease in diseases and work-related losses due to sick building syndrome.
- Apparent increase in employee productivity.

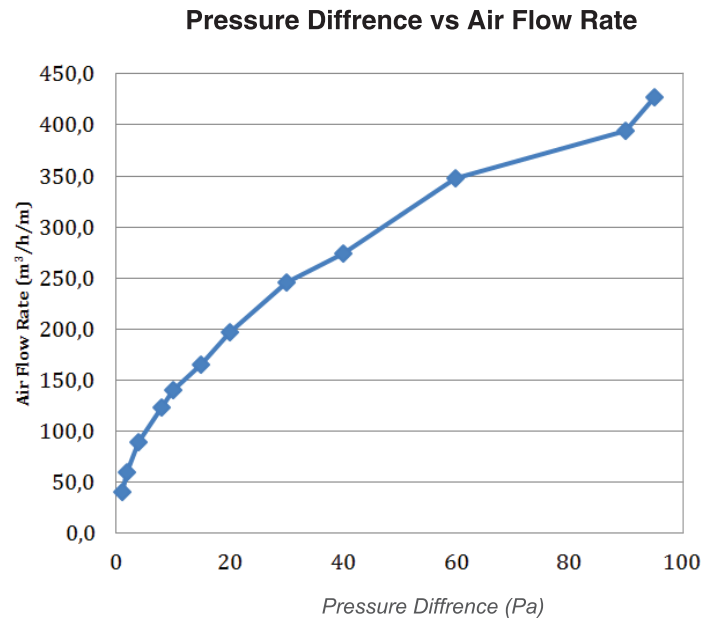
**Trickle Vent system has superior performance in aesthetics, function, cost, comfort, thermal and laboratory performance compared to other types of ventilation systems.**

The Code of Standard	The Name of Standard	Result	Explanation
EN 15242	Trickle Vent Design Criteria	OK	
EN 13141 -1	Ventilation Capacity	OK	
EN 10140 -2	Acoustical Performance	$R_w (C; Ctr) = 40,1 \text{ dB}$	Trickle Vent Closed Position
EN 10140 -2	Acoustical Performance	$R_w (C; Ctr) = 25,8 \text{ dB}$	Trickle Vent Open Position
EN 10848 -2	Flanking Noise Performance	$D_{n,f,w} (C; Ctr) = 52,7 \text{ dB}$	Horizontal Neighbouring
EN 10848 -2	Flanking Noise Performance	$D_{n,f,w} (C; Ctr) = 55,5 \text{ dB}$	Vertical Neighbouring
EN 10848 -2	Flanking Noise Performance	$D_{n,f,w} (C; Ctr) = 69,7 \text{ dB}$	Diagonal Neighbouring
EN ISO 12152	Air Infiltration	Class A4 600 Pa	
EN 12154	Water Tightness	Class R7 600 Pa	
AAMA 501.1	Water Tightness	OK	
AAMA 501.2	Water Tightness	OK	
EN 13116	Wind Load Resistance	2400 Pa OK	
AAMA 501 -4	Seismic Performance	OK	

*Trickle Vent Testing Results*

# TRICKLE VENT Integrated Curtain Wall Natural Ventilation System

Pressure Difference IN-OUT (Pa)	Air Flow Rate (m <sup>3</sup> /h/m)
1	41,0
2	60,0
4	88,9
8	123,7
10	140,5
15	165,4
20	197,3
30	245,9
40	274,0
60	347,6
90	394,5
95	427,6



Pressure difference vs. air flow rate (Metric Unit)

The fresh air supplied through a 1-meter-wide Trickle Vent under 1 Pa indoor-outdoor pressure difference is 41m<sup>3</sup>/h, which is more than the requirement for one person in an office environment (8.5 m<sup>3</sup>/h).

The annual average wind velocity for Istanbul region is 6 m/s. The pressure at this wind velocity will be 20 Pa. The amount of fresh air that can be supplied by 20 Pa relative pressure is 197.3 m<sup>3</sup>/h.

The average mechanical ventilation system provides 1000 m<sup>3</sup>/hour fresh air flow for a 100 m<sup>2</sup> office space. Meanwhile, a 5.1 m. Trickle Vent implemented within a façade system provides the same amount of fresh air flow for that same office.

## COST PERFORMANCE



Thanks to the 2500 m Trickle Vent system applied in Torun Tower project, initial investment cost of mechanical ventilation system was reduced by approximately up to 46%.

Energy saving potential by reducing air conditioning system load with night cooling in Torun Tower project is realized as 125000 kWh for a three-month period, which corresponds to \$26000 (based on unit price of electricity in June 2014 in Turkey)

Trickle Vent is a user friendly system that can be easily removed for cleaning by building occupants. Therefore, there is no considerable operation cost.

By effective use of Trickle Vent system applied in Torun Tower project;

- Savings up to 706000 kWh annually thanks to mechanical ventilation capacity reduction and taking advantage of night cooling effectively,
- More economical electricity cost (Savings up to 140,000 \$ per year),



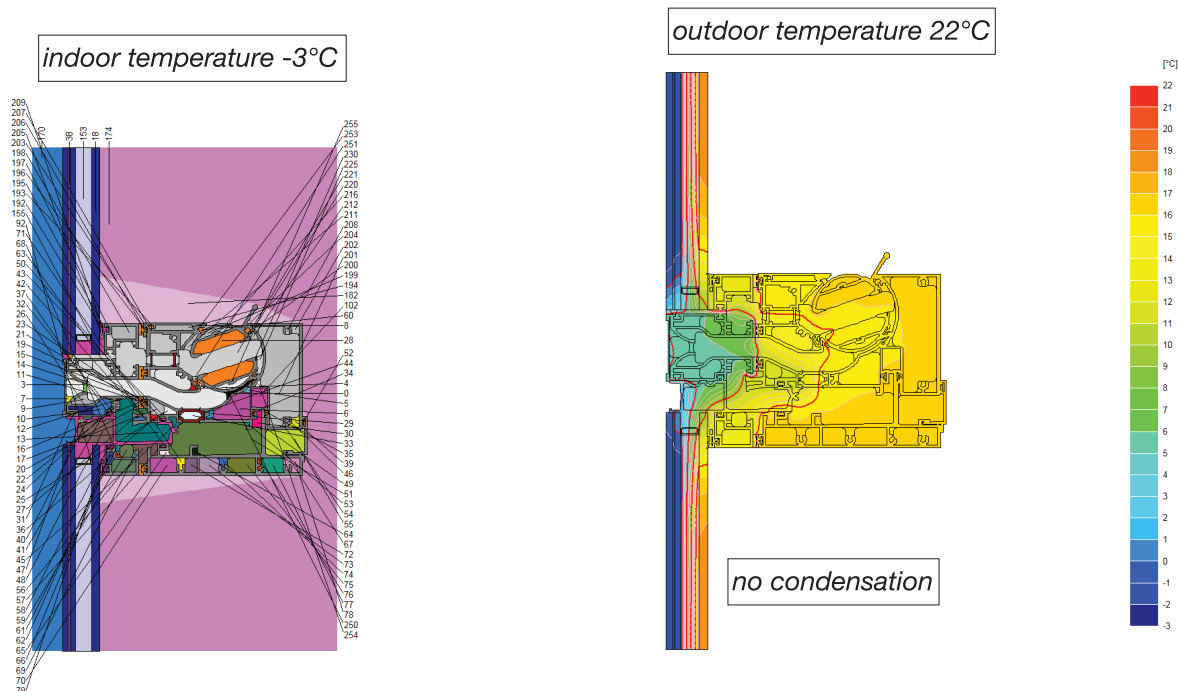
- **Less CO<sub>2</sub> emission** (up to 697000 kg CO<sub>2</sub> per year (same benefit provided by 12600 trees!) is never emitted into the environment).



**All these savings play significant role to be awarded LEED Certificate with Gold Level.**

## THERMAL PERFORMANCE

There is no condensation formation risk neither on profile surface nor on glass surface in both Trickle Vent open position and closed position.



Condensation Analysis

Thanks to its energy oriented design, Trickle Vent natural ventilation system integrated unitized panel systems achieves:

- Double Glazed Unitized Panel System; Up to  $U_w=1,3$  W/m<sup>2</sup>K curtain wall overall thermal transmittance
- Triple Glazed Unitized Panel System; Up to  $U_w=0,8$  W/m<sup>2</sup>K curtain wall overall thermal transmittance.

## LABORATORY TEST RESULTS

Performance tests of Trickle Vent system were carried out by FTI (Façade Testing Institute) which is solution partner of METAL YAPI. Corresponding test results are indicated below.

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Test results clearly illustrates that theoretical calculations are justified by means of experimental method. Besides, test results also proves engineering success behind the system design. In brief, Trickle Vent system has significant advantageous in comparison with other ventilation systems from aesthetic, functionality, cost, thermal and lab performance aspects. Consequently, Trickle Vent new generation natural ventilation system developed by METAL YAPI achieves the same comfort conditions by mechanical ventilation systems as well as taking advantage of clean, healthy, fresh air supply by natural ventilation. In addition to this, it is possible to solve natural ventilation problem in high rise buildings thanks to this innovative, high-tech product designed by METAL YAPI.