A Breath of Freshness in Shopping centers, and Public places, Offices

Shopping centers

Fresh air-improving the overall quality of working life

Shopping center owners understand that having customers stay longer leads to higher sales.
As such, there is a heavy energy burden on shopping centers in adjusting the temperature and humidity levels to ensure the optimum climate for customers and minimize the spoiling of merchandise. It is essential to eliminate air contaminated with the numerous odors and chemicals emitted by foodstuffs and chemical fibers. The energy losses entailed in expelling this air are tremendous, and the issue of how to recover the lost energy is a serious business concern.
The Lossnay is a static total energy recovery unit that is capable of recovering a large proportion of the energy lost through heavy duty ventilation systems. All shopping center operators should consider using the unit as a means of solving their ventilation problems.
The system serves two functions: it provides customers with an ideal climate of fresh air supplied at room temperature; and it offers advantages to operators by recovering air-conditioning running costs, alleviating air-conditioning capacity, and lowering the initial cost of buying air-conditioning equipment. Operators will also be impressed by the reduction in energy losses and the system's eco-friendliness.

Public place

Fresh air-improving the overall quality of working life

The average area occupied per person in public halls, theaters, and cinemas is usually calculated as between 0.5 m^2 and 1 m^2. As such, people gathering in these locations will generate a large volume of CO_2. The air will also contain dust from clothing and natural body odors. Air-conditioning and ventilation therefore play a vital role in maintaining a pleasant environment for the person, who spends an average of two hours in the building, and this entails a heavy cost burden on the owner. Ventilation involves huge energy losses, and the issue of how to recover the lost energy is a major business concern.
The Lossnay unit solves the energy loss problems involved in large-volume ventilation by recovering a large proportion of the energy lost by the central air-conditioning unit.
Therefore, the owner can both reduce energy bills, and provide a more pleasant, eco-friendly environment for shoppers, which improves the customer image.

Offices

Fresh air-improving the overall quality of working life

Many modern office buildings today are heavily insulated air-tight structures with little or no natural ventilation. The unnatural environment created by air conditioners without added ventilation is a breeding ground for bacteria. Factor this in with the accumulation of pollutants and odors in the from of cigarette smoke, formaldehyde, pollen, dust, and carbon dioxide, and the necessity of ventilation becomes ever more apparent. In fact, poorly ventilated buildings can give rise to Sick Building Syndrome, a malady that is known to cause headaches, sore eyes, itching, and concentration loss.
This usually results in discomfort, or worse, sickness, for the building's occupants, which reduces the productivity of the workforce. Fresh air, effectively ventilated throughout the building, is therefore essential to the overall quality of working life.

If it's Lossnay...

Places where a large number of people gather require large-volume ventilation to eliminate a wide range of odors and chemical substances.	Air-conditioning involves high energy consumption.	The energy wasted through ventilation also represents high running costs.
Let the Lossnay unit solve these problems.	The Lossnay unit can be combined with ventilation systems in many kinds of buildings to recover the energy lostthrough ventilation.	Air-conditioning energy losses are recovered, enabling the employment of a lower-capacity ventilation system, which reduces the initial costs.

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Changes for the Better

MITSUBISHI ELECTRIC
ENERGY RECOVERY UNIT

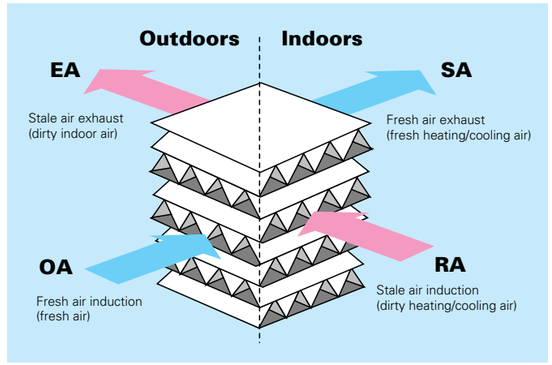
Lossnay

Mitsubishi Electric Quality

Time Spent in Comfort... with a Breath of Fresh Air

The pioneering Mitsubishi Lossnay uses unique technology allowing inlet air and exhaust air to cross at the element without intermixing. Only the Lossnay is capable of providing ideal ventilation at close to room temperature and humidity.

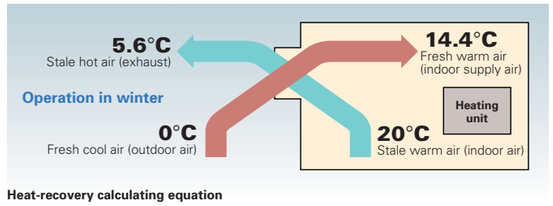
■Lossnay Core Construction & Principle



The basic principle

The remarkable technology that permits the intake of fresh air with minimal loss to indoor temperature is know as the Lossnay Core.
The cross-flow, plate-fin structure of the heat-recovery unit along with a specially processed diaphragm keep supply and exhaust air separate, ensuring that only fresh air is introduced to the indoor environment while also allowing for the efficient transfer of heat.

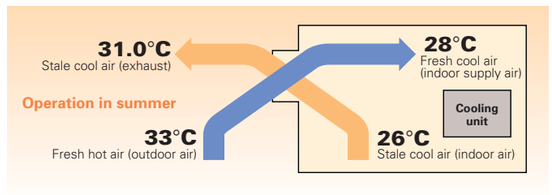
■Total-Heat-Recovery Concept



Heat-recovery calculating equation

Indoor supply-air temperature (°C) = (Indoor temperature (°C) - Outdoor temperature (°C)) × Temp recovery efficiency (%) + Outdoor temperature (°C)

Calculation example : 14.4°C=(20°C-0°C)×72%+0°C



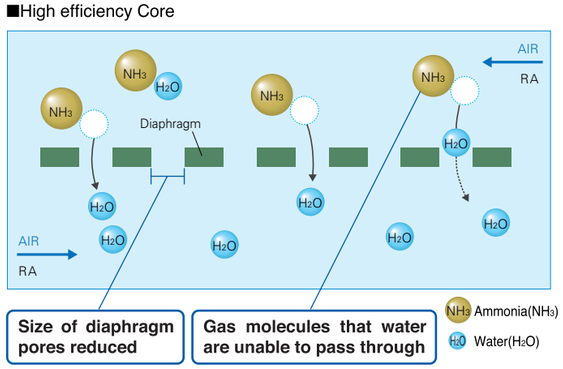
Heat-recovery calculating equation

Indoor supply-air temperature (°C) = Outdoor temperature (°C) - (Outdoor temperature (°C) - Indoor temperature (°C)) × Temp recovery efficiency (%)

Calculation example : 28°C=33°C-(33°C-26°C)×72%

Every building needs a supply of fresh air to keep its inhabitants healthy and comfortable. Outdoor air though is rarely, if ever, the precise temperature that is maintained indoors by the building's air conditioning system. In the summer, it is too hot. In the winter, it is too cold. This puts added stress on the air conditioner to compensate for the intake of the hot or cold air adding to the expense of operating the system. Lossnay all but eliminates this problem with original heat-recovery technology that uses the heat of the stale indoor air to be expelled in order to either heat or cool the incoming fresh air to a temperature much closer to the existing indoor air. This process reduces the load on the air conditioning system without cutting off the supply of vital fresh air.

■High efficiency Core



The improvements

The microscopically small pores of the diaphragm have been made even smaller, decreasing the rate at which water soluble gases such as ammonia and hydrogen pass through. Further, a new specially processed paper used to make the diaphragm has been developed with high moisture permeability characteristics that aid in the transference of moisture for improved heat exchange efficiency. These developments further improve moisture permeability and effectiveness in shielding unwanted gases, resulting in a lower rate of gas transference and more highly efficient heat transfer.

Construction and operating principle

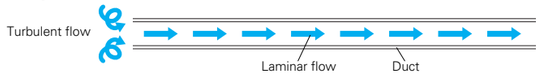
The air inlet and outlet ducts are separated so that the inlet air and exhaust air do not mix.

Moving parts

There are no moving parts because the core is fixed.

Lossnay core clogging

Dust has a tendency to adhere to the Lossnay core surface, but can be easily removed.



Air leakage and gas transition rate

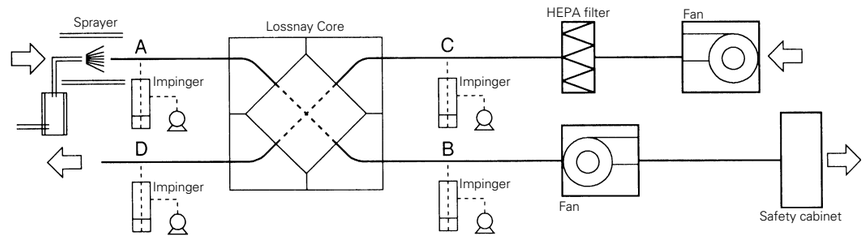
The location of the fan in relation to the core enables excess airflow (approx. 10%) to be bled into the exhaust air, totally preventing contamination of the fresh air supply.

Test results for exhaust bacteria passing through the inlet

Independent tests confirm that the Lossnay core prevents bacteria from passing from the exhaust air to the fresh air supply.

1 Test method

The configuration of the test equipment is shown below. The test bacteria suspension is sprayed in the outlet duct at a pressure of 1.5 kg/cm^2 with a sprayer whose dominant particle size is 0.3 - 0.5μm. The air sampling tubes are installed at the each center of the locations of A, B, C, D, in the Lossnay inlet/outlet ducts so that their openings are directly against the air flow, and then connected to the impinger outside the duct. The impinger is filled with 100 mL physiological salt solution. The amount of airborne bacteria is sampled at the rate of 10 L air/minute for three minutes.



2 Test results

The results using bacillus subtilis (grass bacillus) showed that when a mean 2 x 10^4 bacteria (measured 5 times) was introduced at exhaust inlet A, approximately 1.5 x 10^4 was emitted at exhaust outlet B. The results showed that no more than 10^3 bacteria were detected at air supply outlet D.

3 Independent verification

Kitasato Research Center of Environmental Sciences

Maintenance

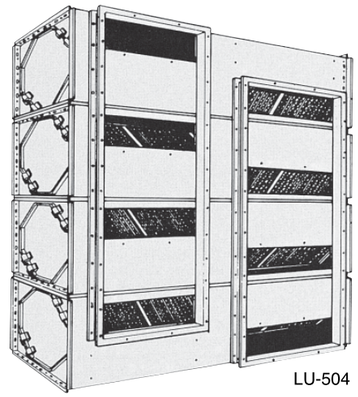
The filters must be cleaned at least once a year, and the Lossnay core must be cleaned at least once every two years. (Clean more frequently if necessary.)
* Clogging is the result of dust building up on the core surface, which can be easily removed. Only the two faces of the core air inlet ducts need to be cleaned.

Lossnay Horizontal Units

For medium- and large- scale buildings　Type LU-500, Types LU-502~505

This is a series of horizontal Lossnay units which incorporates a total heat exchanger only. Please use these as well as the vertical units, according to available installation space and convenience for the ductwork. A filter for the exclusive use with this type of unit is available optionally. A complete range (up to 25,000 m^3/h) is also available. Please use this series in combination with the fans.

LU-500



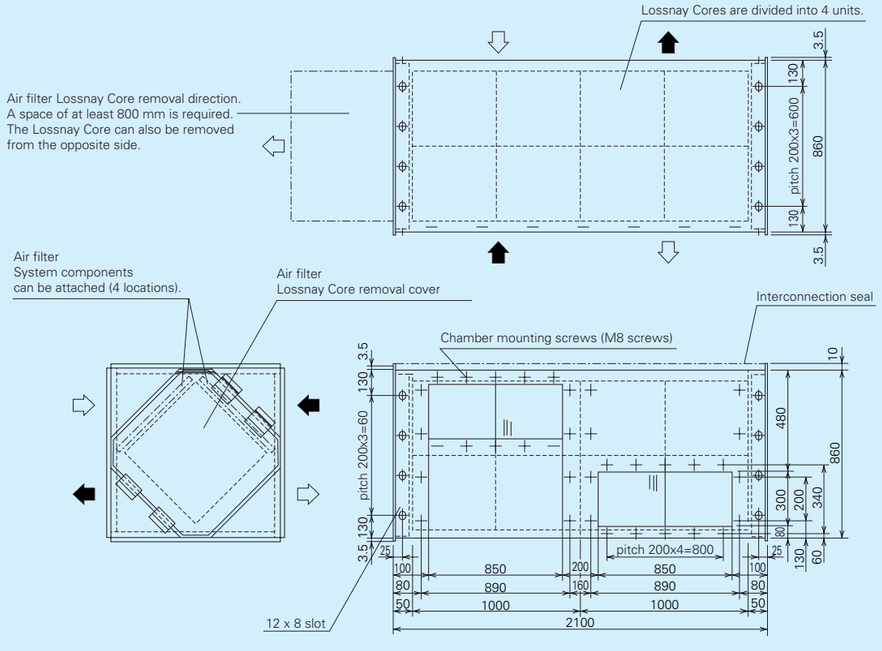
LU-504

■Performance

		Single type	Combination Type			
Type		LU-500	LU-502	LU-503	LU-504	LU-505
Standard air volume (m^3/h)		5000	10000	15000	20000	25000
Heat-exchange efficiency (%)		72	72			
Enthalpy-exchange efficiency (%)	Heating	67	67			
	Cooling	62	62			
Static- pressure loss (mmH_2O)		32	32			
Product weight		250	513	795	1024	1280
Finish color		Munsell 5Y 6.5/1				
Configuration		②	②×2	②×3	②×4	②×5

■Outlines and dimensions

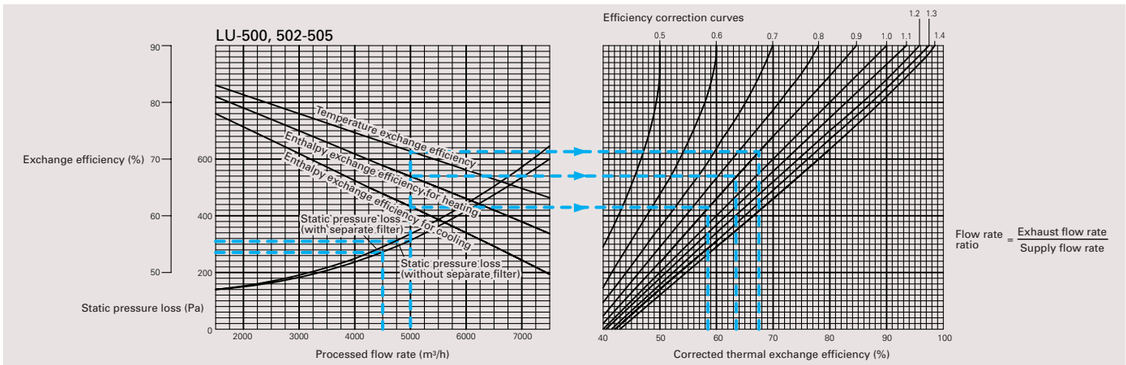
(Single type)
LU-500



(Unit:mm)

Lossnay Horizontal Units (Continuation)

■Characteristic curve

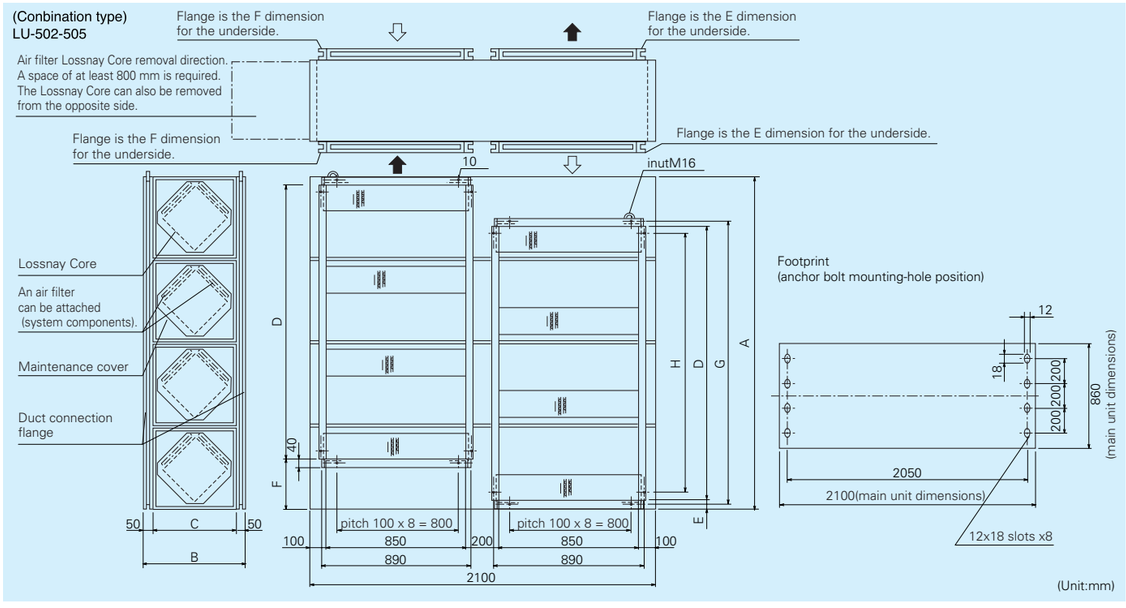


Multiply by the number of units in conjunction with the LU-500 type airflow for combination type models.

The method for correcting the efficiency of the ventilation system when exhaust flow rate and supply flow rate differ:
First calculate the exhaust flow rate ratio (i.e. flow rate ratio = exhaust flow rate / supply flow rate) for the supply flow rate, and then determine the flow rate ratio curve. Next plot the supply flow rate on the processed flow rate points, and transfer the intersections between these points and the efficiency curves to the efficiency correction curves on the right. The intersections with the flow rate ratio curves form the corrected thermal exchange ratios.

■Outlines and dimensions

(Conbination type)
LU-502-505



(Unit:mm)

Type	A	B	C	D	E	F	G	H
LU-502	1730	600	500	1170	80	480	1200	Pitch 100X10=1000
LU-503	2600	960	860	2040	80	480	2080	Pitch 100X20=2000
LU-504	3470	960	860	2910	80	480	2950	Pitch 100X27=2700
LU-505	4340	960	860	3780	80	480	3820	Pitch 100X36=3600

Notes

1. The combination type can be used with the single types and a flange set is supplied as an optional part.
2. The flange can be reinstalled from the outer flange to the inner flange when it is assembled at the same pitch.
3. The combination type is delivered as separate units divided into each single type).
4. This product is for indoor installation.

■Optional parts

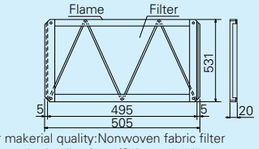
Flange set

Flange set type number	Combination type number	Necessary number of LU-500s
PZ-502FR	LU-502	2
PZ-503FR	LU-503	3
PZ-504FR	LU-504	4
PZ-505FR	LU-505	5

Filter

Type number	Combination type number	Necessary number of LU-500s	
		supply side	exhaust side
PZ-500F	LU-500	4	4
	LU-502	8	8
	LU-503	12	12
	LU-504	16	16
	LU-505	20	20

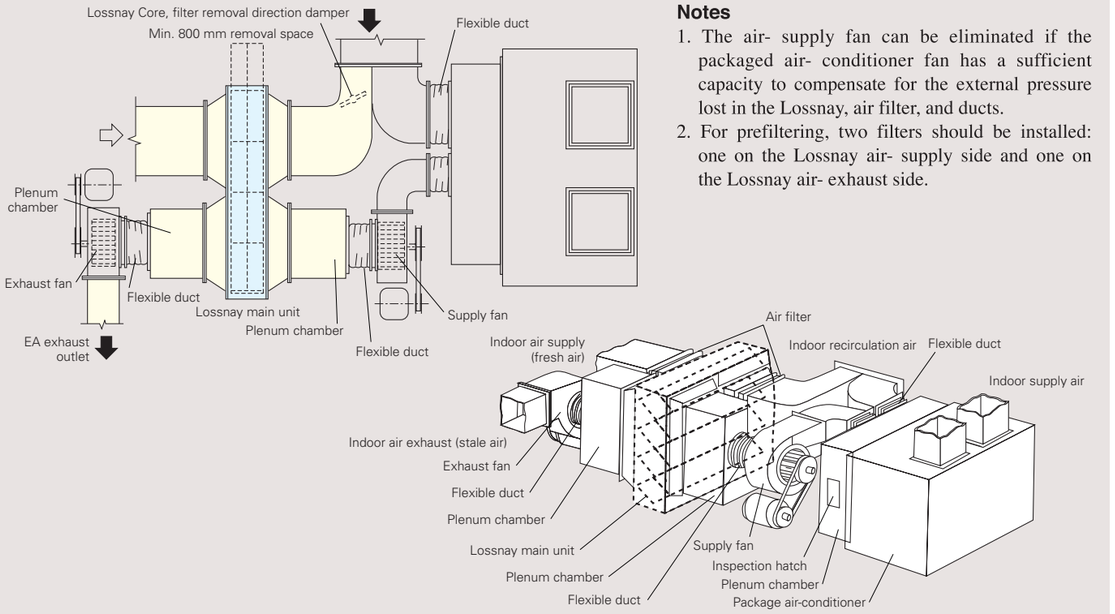
■Outline



*Filter makerial quality:Nonwoven fabric filter
(Mass method collection efficiency 85%)

(Unit:mm)

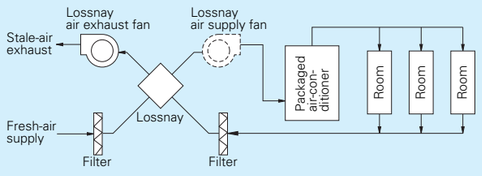
■Installation example



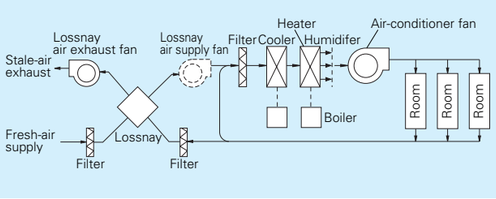
Notes

1. The air- supply fan can be eliminated if the packaged air- conditioner fan has a sufficient capacity to compensate for the external pressure lost in the Lossnay, air filter, and ducts.
2. For prefiltering, two filters should be installed: one on the Lossnay air- supply side and one on the Lossnay air- exhaust side.

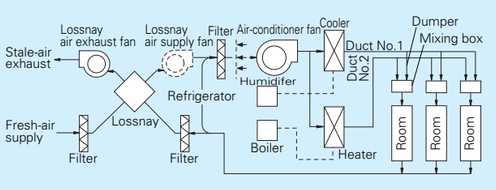
(1) Combination with a Packaged Air Conditioner



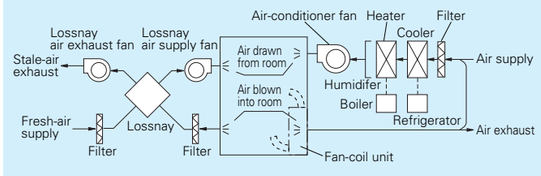
(2) Combination with a Single-Duct System



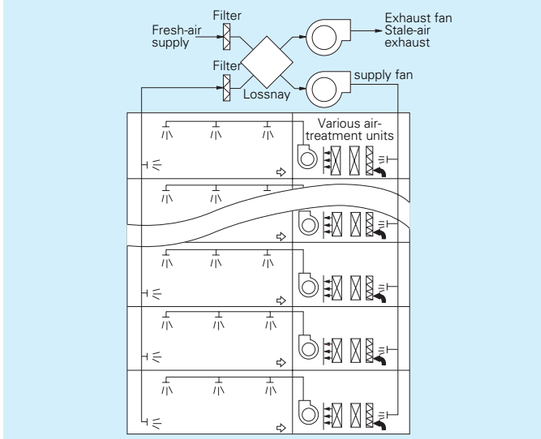
(3) Combination with a Double-Duct System



(4) Application to Existing Equipment and Parallel Use with a Fan Coil



(5) Primary Air Treatment with One Lossnay Per Floor



System Design Recommendations

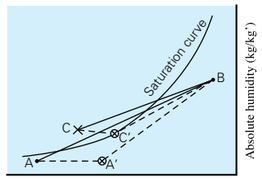
→ Lossnay Usage Conditions

	Main unit installation conditions	Outdoor air and exhaust air conditions
Light commercial-use Lossnay	-10°C to +40°C, RH80% or less	-10°C to + 40°C, RH80% or less
LU type	-10°C to +50°C, RH80% or less	Same as left

In some cases special attention needs to be paid to extreme operating conditions. These are described as below:

1 Use in cold climates
(Outdoor temperature: –5°C or less)

Plot the Lossnay intake air conditions A and B on a psychrometric chart as shown on the right. If the high temperature side air B intersects the saturation curve such as at C, moisture condensation or frosting will occur on the Lossnay. In this case, the low temperature side air A should be preheated to the temperature indicated by point A' so that point C shifts to the point C'.



2 Use in high humidity conditions
(Relative humidity: 80% or more)

When using the system in high humidity conditions such as heated pools, bathrooms, mushroom cultivation houses, etc., moisture will condense inside the Core, and drainage will occur. In these cases, the general purpose Lossnay that uses treated paper cannot be used.

3 Use in other special conditions

- The Lossnay cannot be used where toxic gases and corrosive substances such as acids, alkalis, organic solvents, oil mist or paints exist.
- For recovery of heat from odor-laden air that cannot be supplied to another place (area).
- Avoid use where salt or hot water damage may occur.

→ Attachment of Air Filter

An air filter must be mounted to the air inlets (both intake and exhaust) of the Lossnay to clean the air and to prevent the Core from clogging. Always mount this filter, and periodically service it.

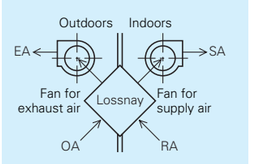
→ Duct Construction

- Always treat the two ducts on the outdoor side (outdoor air intake and exhaust outlet) with insulation to prevent frosting or condensition.
- The outdoor duct gradient must be 1/30 or more (to wall side) to prevent rain water from infiltrating the system.
- Do not use the standard vent caps or round hoods where they may come into direct contact with rain water. (Instead, use of a deep hood is recommended.)

→ Positioning of the Supply/Exhaust Fans and the Air Transmission Rate

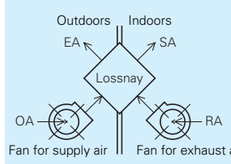
The following four methods can be used for when setting the Lossnay supply and exhaust fans around the Lossnay Core. When using the LU models, methods a or b should be used in respect of both the Lossnay Core air leakage and effective air ventilation. Use method c if air leakage to the RA or SA sides is not allowed, such as in hospital air conditioning, or transmission of the fan noise into the room must be suppressed by putting the Lossnay Core between the supply/exhaust fans and room, and if a certain degree of air leakage is allowed between OA to EA.

a Installing the supply fan (OA-SA) and exhaust fan(RA-EA) for suction feed to the Lossnay Core



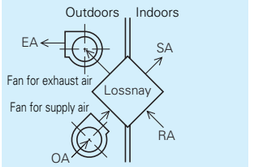
If the static pressure difference between SA and RA and between EA and OA is 50mmAq, the air leakage rate will be 2.5%, and 3.4%. This value is of no problem for most standard uses.

b Installing the supply fan (OA-SA) and exhaust fan (RA-EA) for forced supply to the Lossnay Core



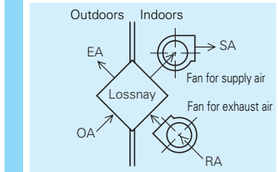
The air leakage rate is the same as in system a.

c Installing the supply fan (OA-SA) for force feed and the exhaust fan (RA-EA) for suction feed



In this case, the positive/negative relation of the static pressure will be the reverse of that in system d, and the air leakage outside the room (leakage from OA to EA) will be the same as system d. Thus, the effective volume of ventilating air will be reduced by that rate.

d Installing the supply fan (OA-SA) for suction feed and the exhaust fan (RA-EA) for force feed



In this case, the intake side pressure (OA-SA) will be negative, and the exhaust side pressure (RA-EA) will be positive, so the amount of air leakage to the intake side will be the greatest. If the static pressure difference between OA and RA is 50 mmAq, the air leakage rate will be 10.5%, and 13.0%.
This system can be used when an air leakage of 10% to the intake side (OA-SA) is permitted, but should be avoided in all other cases.