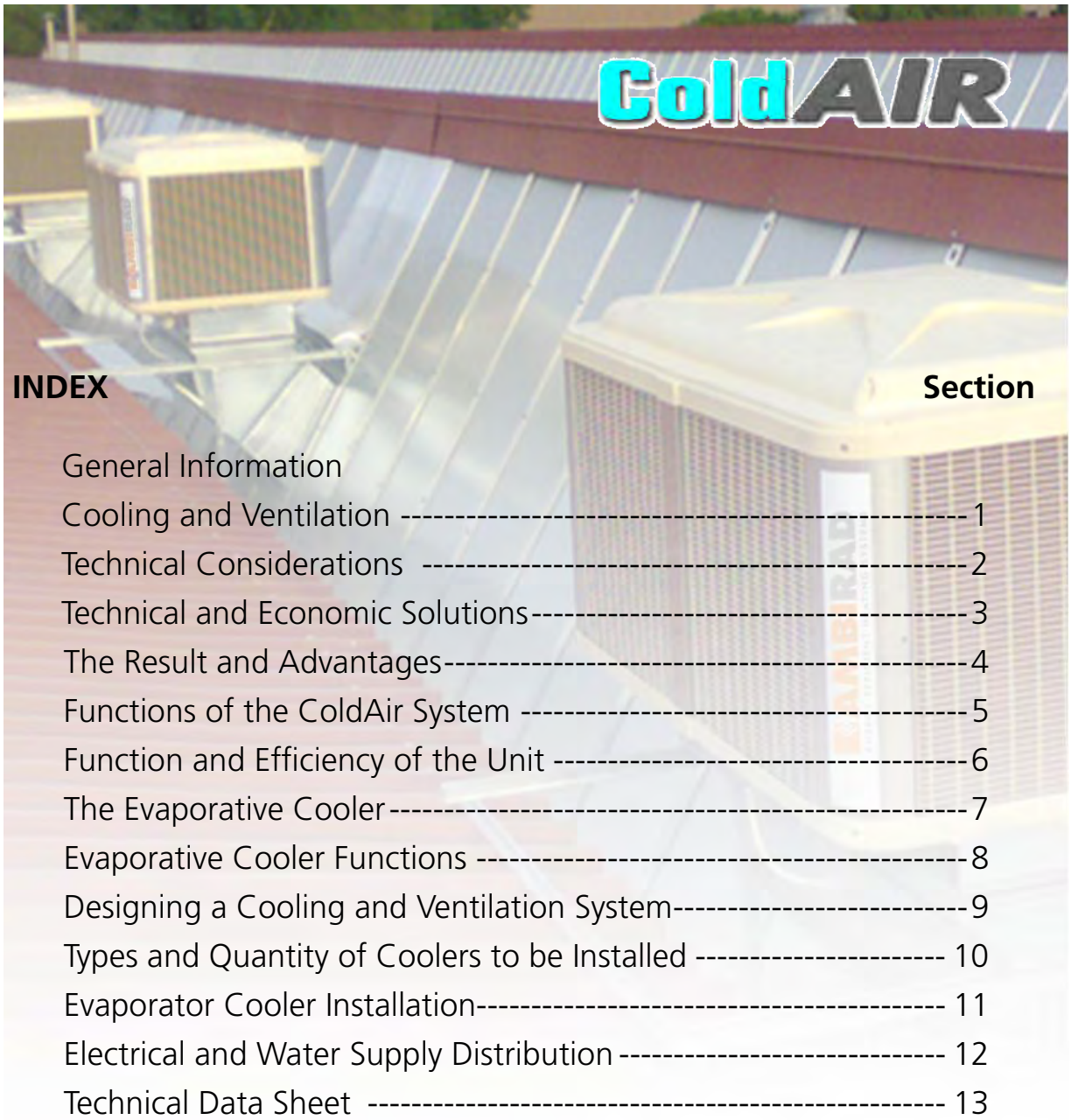
NORDAIRNICHE

WA & RA EVAPORATIVE COOLERS

INSTRUCTION MANUAL



INDEX **Section**

General Information
Cooling and Ventilation ---------- 1
Technical Considerations ---------- 2
Technical and Economic Solutions ---------- 3
The Result and Advantages ---------- 4
Functions of the ColdAir System ---------- 5
Function and Efficiency of the Unit ---------- 6
The Evaporative Cooler ---------- 7
Evaporative Cooler Functions ---------- 8
Designing a Cooling and Ventilation System ---------- 9
Types and Quantity of Coolers to be Installed ---------- 10
Evaporator Cooler Installation ---------- 11
Electrical and Water Supply Distribution ---------- 12
Technical Data Sheet ---------- 13

WARNINGS

Nortek Global HVAC (UK) Ltd equipment must be installed and maintained in accordance with any relevant obligations arising from the Health and Safety at Work Act 1974 or relevant codes of practice. In addition the installation must be carried out in accordance with the current IEE wiring regulations (BS 7671) and any other relevant British Standards and Codes of Practice by a qualified installer.
All external wiring MUST comply with the current IEE wiring regulations.

CE

Part No. 703501

Nortek Global HVAC (UK) Limited, Fens Pool Avenue, Brierley Hill, West Midlands, DY5 1QA

Document Index.

GENERAL INFORMATION 3
User Information 3

SECTION 1 – COOLING AND VENTILATION 3

SECTION 2 – TECHNICAL CONSIDERATONS 3
2.1 Internal environment 3
2.2 Security and productivity 3

SECTION 3 – TECHNICAL AND ECONOMIC SOLUTION 5

SECTION 4 – THE RESULT AND ADVANTAGES 6

SECTION 5 – FUNCTIONS OF THE COLDAIR SYSTEM 6

SECTION 6 – FUNCTION AND EFFICIENCY OF THE UNIT 7

SECTION 7 – THE EVAPORATIVE COOLER 7

SECTION 8 – EVAPORATIVE COOLER FUNTIONS 8
8.1 Technical description of the automatic cleaning system 9
8.2 Normal Maintenance 9

SECTION 9 – DESIGNING A COOLING AND VENTILATION SYSTEM 9
9.1 External summer conditions 9
9.2 Installation height of the air diffusers in the building 10
9.3 Number of air changes required depending on the type of activity in the building 11
9.3 Air evacuation openings. 12

SECTION 10 – TYPES AND QUANTITY OF COOLERS TO BE INSTALLED 13

SECTION 11 – EVAPORATOR COOLER INSTALLATION 14

SECTION 12 – ELECTRICAL AND WATER SUPPLY DISTRIBUTION 18
12.1 Water supply distribution 18
12.2 Electrical supply distribution 18

SECTION 13 – TECHNICAL DATA SHEET 19

General Information.

User Information

This manual is a guide to aid the design of an evaporative cooling ColdAIR system.

This guide demonstrates the considerable energy reduction and the reduced environmental impact that are the main characteristics of a ColdAIR evaporative cooling system, compared to air conditioning systems with cooling units.

The ColdAIR range of products conform to; European Community Directives and UNI EN ISO 9001:2000

1.0 Cooling and Ventilation

The ColdAIR adiabatic evaporative cooling system represents the most modern technology to cool and ventilate large premises:

- Factories
- Foundries
- Garden centres
- Warehouses
- Commercial premises
- Sport centres
- Gymnasiums
- Exhibition halls
- Temporary structures
- Greenhouses
- Public halls
- Engineering workshops
- Bakeries
- Food markets

and many other premises where traditional air conditioning systems would imply high installation and operating costs.

The ColdAIR system provides large premises with summer cooling to:

- improve the workers comfort
- increase their wellbeing and productivity

The above benefits are provided:

- without having to invest large amounts of money
- without having to encounter high costs for energy consumption
- without any environmental impact
- without contributing to black-out window requirements

2.0 Technical Considerations

2.1 Internal environment

Inside large industrial premises, during a hot summer, the internal environment can reach a condition such that it is difficult for operatives to work effectively

Heat created by process machinery, lighting, and solar gain on the building fabric, transmit high thermal energy to the air inside the building. All these factors create an uncomfortable working environment.

Furthermore, when the premises are closed for the night, the heated air stagnates inside the building to create an unbearable ambient temperature in the morning.

To potentially compound the problem, it could also be that the incorrect number of air changes are provided within the building to evacuate the unpleasant stale air.

2.2 Security and productivity

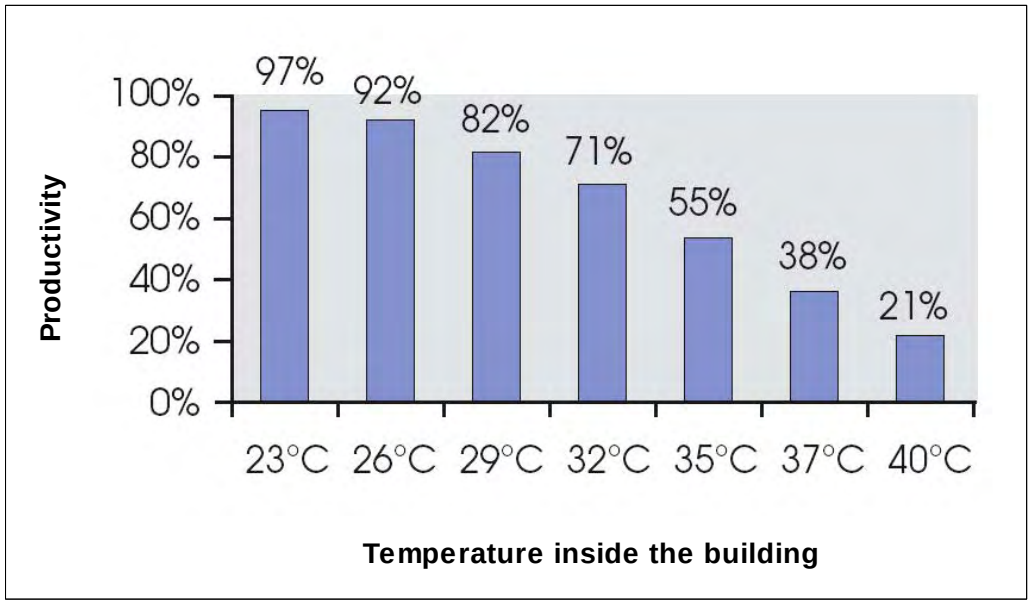
Unhealthy working conditions created by high industrial temperatures cause heat stress. Heat stress, which begins at temperatures over 27°C, creates:

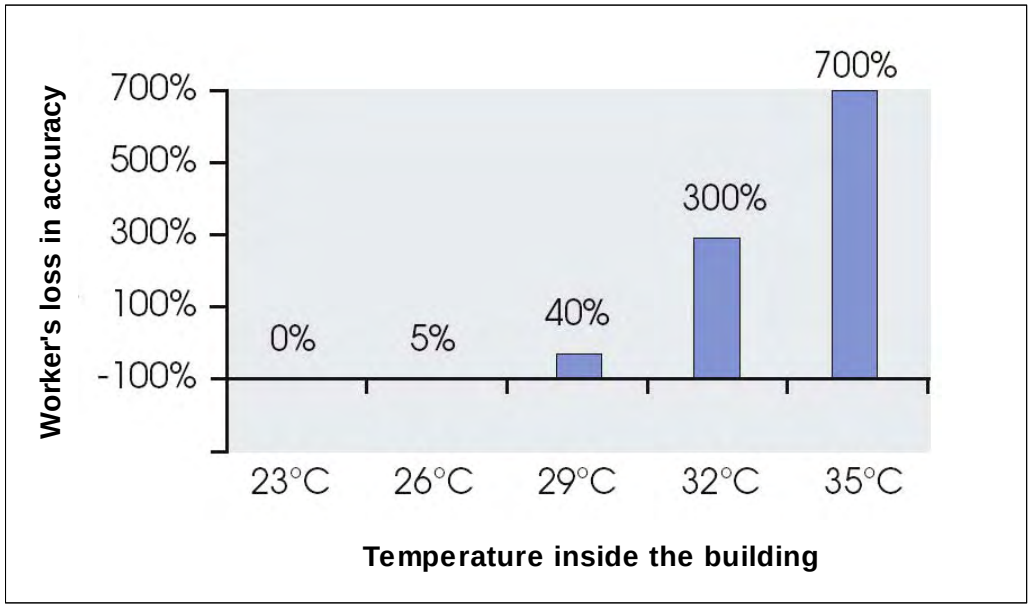
- Low Morale, caused by heat discomfort
- Delay and Absenteeism
- Reduced attention to Safety
- Potential Health Issues

It has been demonstrated by various research projects that excessive heat can affect worker performance in both productivity and accuracy as reported by NASA research:

NASA Report CR-1205-1

Effective temperature	23°C	26°C	29°C	32°C	35°C	37°C	40°C
Loss in work output	3%	8%	18%	29%	45%	62%	79%
Loss in accuracy	—	5%	40%	300%	700%	—	—





NASA Report CR-1205-1 shows for example that when temperatures inside the building rise over 29°C, productivity drops by 18% and accuracy suffers from a 40% increase in error.

3. Technical & Economical Solution.

It is necessary to increase the air change rate within the building to prevent the accumulation of heat and avoid the excessive temperature rise inside the premises.

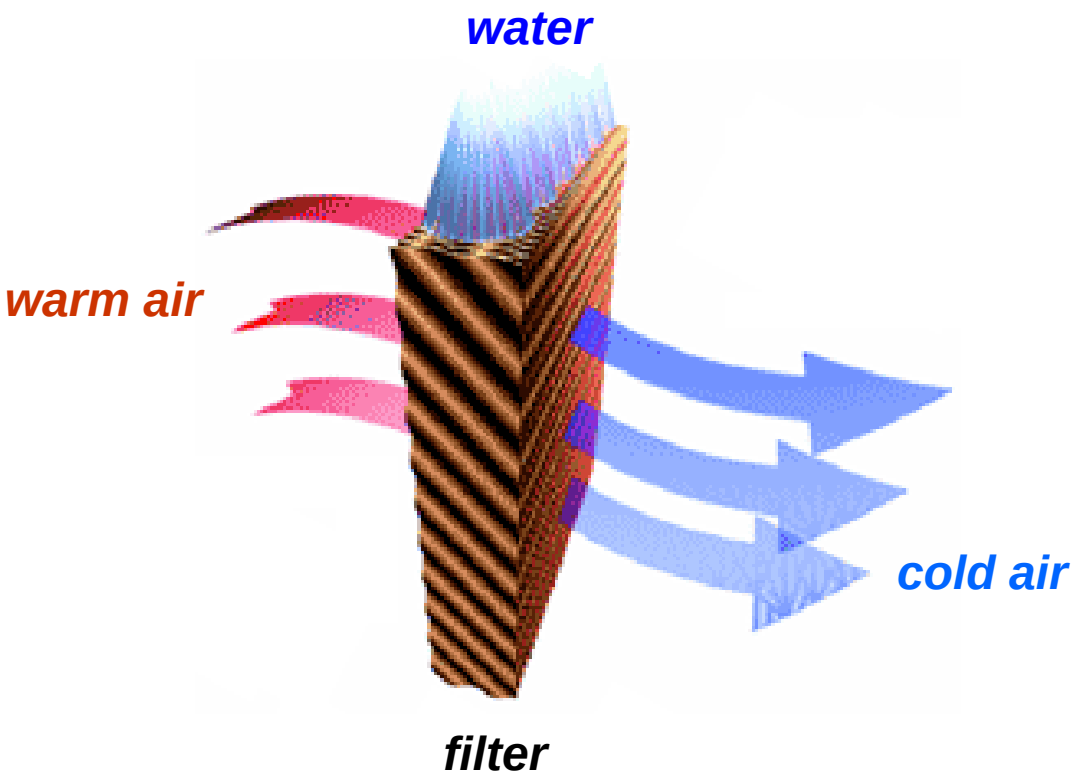
A good result is obtained by providing the building with 10 air changes per hour.

The air changes are necessary to improve the hygiene level and to eliminate eventual smells or particles harmful for people's health.

The choice of a traditional air conditioning system is not advised for the following reasons:

- the large volume of air to be treated
- the impracticality of keeping the building doors closed for logistical reasons
- expensive installation of refrigeration units and air distribution systems
- high operating energy costs
- high maintenance costs

Much more adapt to this situation and more economically viable is the use of a ColdAIR cooling and ventilation system that cools the air using a natural and not mechanical principle



The ColdAIR evaporative cooler is a product that cools the air by reducing the sensible heat contained in the air.

The evaporation process of the water that comes in contact with the treated air provides the reduction of the sensible heat in that air:

As the external air passes through specially structured cellulose filters wet with water, it looses part of its heat during the water evaporation process and lowers its temperature.

The fan, installed inside the cooler, supplies the building with the cooled air.

4. The Result and Advantages.

The absence of refrigerating units reduces; the system cost by 70% and electrical energy consumption by 80%. The only energy requirement is for the fan, thus reducing the complexity of the system and simplifying the installation, operation and maintenance.

Generic advantages:

- treatment of large volumes of air, providing many air changes
- air filtering
- air cooling
- possibility to only ventilate in the cooler seasons
- possibility to cool only specific areas or have different cooling in various areas
- low cooling system costs, low running costs, low maintenance costs
- low energy requirements
- no refrigerant gas, no environmental impact
- improvement of the internal hygiene environment

5. Functions of the ColdAIR System.

Ventilation and “cleaning” of the inside environment

The ColdAIR evaporative cooling system works in a dynamic way based on a natural principle: It introduces into the building large quantities of cooled external air and expels the stale warm air through doors, windows and other evacuation openings.

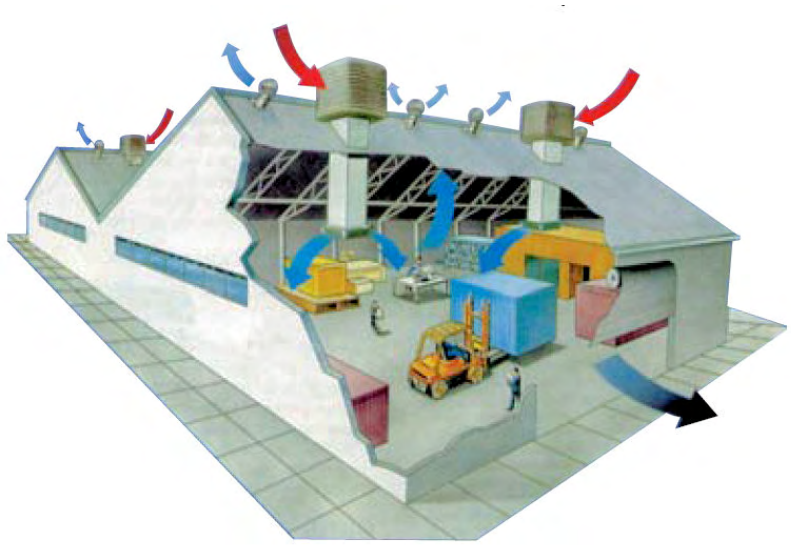
A very simple principle. If the system can evacuate the same amount of air introduced, it will work at its maximum efficiency.

The ideal installation condition, if allowed by the roof space, would be to position the air diffusers far away from the windows. Opening a window far way from the air diffuser will allow the air to pass throughout the room resulting in cooling it down. By correctly calculating the door and window openings it is possible to reach the maximum efficiency of the unit.

The system must be capable of expelling all the new air introduced so that the efficiency of the system is not reduced.

If the existing openings in the building are not sufficient it will be necessary to install a forced air extraction system. Failure to comply with these conditions will; reduce the designed air changes, reduce the cooling effect and cause the inside relative humidity of the air to rise.

INPUT COOL AIR **OUTPUT WARM AIR**



6. Function and Efficiency of the Unit.

As warm air passes through the unit, it comes in to contact with the wet filter pads and evaporation takes place.

When the water evaporates it takes heat from the air and so cools the incoming air. The temperature drop of the air through the unit is related to the relative humidity of the external air. As relative humidity decreases the evaporation increases and correspondingly the cooling effect is increased.

To maximise the evaporation, the surface area of the filter pads and the air speed have been optimised to give a saturation efficiency of 80%

The cooling performance is detailed in the following table.

Relative Humidity		UR 30%	UR 40%	UR 50%	UR 60%	UR 70%
External Air				**Output Air °C**		
20°C	**°C**	**12**	**13.5**	**14.5**	**16**	**17**
25°C	**°C**	**16**	**17**	**18.5**	**20**	**21.5**
30°C	**°C**	**19**	**21**	**23**	**24.5**	**26**
35°C	**°C**	**22.5**	**25**	**27.5**	**29.5**	**31**
40°C	**°C**	**26**	**29**	**31.5**	**33.5**	**36.5**

These efficiencies are obtained with the use of ColdAIR adiabatic evaporative coolers with high saturation efficiency (88%). Ref: 1013mbar @ sea level

7. The Evaporative Cooler.

The ColdAIR evaporative cooler is a unit that must be connected to electrical and water supplies. It can be installed on the roof or through a wall or window in the premises.

The system is completed by attaching ducts and air distributors to the unit.

Two versions are available:

RA/RC **for roof installation**
WA **for wall or window installation**

All models are supplied with an ABS external structure that is suitable for outdoor installation and is particularly light. This is a very important aspect for buildings that have constraints due to the building structure.

All models have the following equipments:

- Low consumption electric fan
- Water upload system with an electronic valve
- Water distribution system with an electronic pump
- High efficiency evaporative panels
- Automatic water discharge system
- Automatic cleaning of complete water system and of the evaporative panels
- Positioning and fixing equipment
- Winter cover



Model RA/RC



Model WA

8. Evaporative Cooler Functions.

The ColdAIR evaporative cooler is equipped with an electronic controller, to control the speed of the air and the choice of function:

- ventilation only
- ventilation and cooling

The ColdAIR evaporative cooler is equipped with an exclusive and special automatic washing system of the internal circuit and of the water tank, this system is essential to maintain the high efficiency of the unit over a long period of time.

Areas within a building can be managed, dependant on the area operational requirements, the season and the comfort of personnel.

When the unit is turned on the water discharge valve (that is normally open) closes, the water upload valve opens and allows the tank to be filled with water. The floater device will limit the amount of water uploaded to what is necessary for the cooling cycle.

The water is pumped up to the distribution system which then wets the evaporative panels.

The electric fan starts and draws the external air through the wet evaporative panels and inputs it into the building.

The water that evaporates during the cycle is replaced automatically by command of the floating device.

By using the electronic controller it is possible to switch the unit from cooling to only ventilation mode to maintain the air changes necessary.

Via the electronic controller it is possible to adjust the speed of the fan to vary the quantity of input air for the specific requirements of the building.





8.1 Technical description of the automatic cleaning system

The ColdAIR evaporative cooler is equipped with an exclusive and special automatic washing system of the internal circuit and of the water tank. This system is essential to maintain the high efficiency of the unit over a long period of time.

Automatic cleaning of the filters is set for every 4 hours (standard): the unit stops its cooling cycle for a few minutes, the water in the cooler is drained out and exchanged with new fresh water that will rinse and clean the filters of any dirt or mineral residuals. When the cooling system is shut off (automatically or manually), the unit will automatically start a cleaning cycle as described above; as a final process the tank will be emptied of the water and left clean and dry to exclude the possibility of formation of bacteria or limescale.

The constant repeating of the cleaning cycle prevents the formation of limescale and other elements on the evaporative panels and in all the circuits. This ensures long lasting and high efficient evaporative panels.

When switching off the unit, (automatically or manually) it proceeds with the wash, as described above.

At the end of the wash it empties the circuit and the water tank to avoid the possibility of development of bacteria and lime scale.

8.2 Normal maintenance

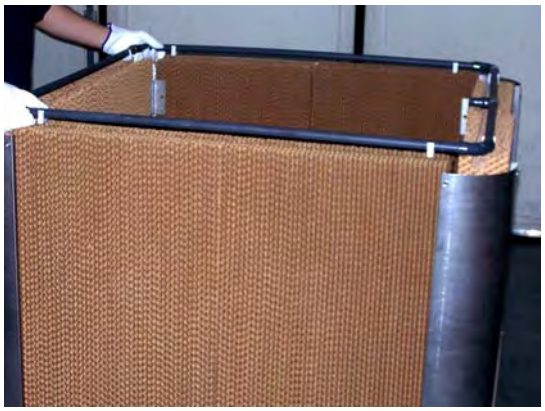
The normal maintenance of the ColdAIR evaporative cooler is limited to the cleaning of the cellulose filter irrigation circuit, the re -circulation pump and the water tank.

It is recommended to drain the water connection pipework to the unit of all water to avoid damage created by freezing conditions.

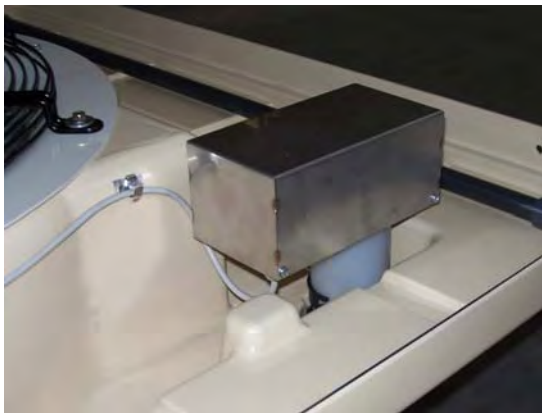
The ColdAIR evaporative cooler must be covered in the winter with a winter hood (provided) to protect the unit from the weather conditions and to avoid cold air entering the building.

It is recommended that the cellulose filters are changed every three years.

- Cellulose evaporative panels, Celdek 50/90, thickness 100 mm –saturation efficiency 80% - Irrigation circuit – Recycling pump
- Automatic cleaning and discharging device









9. Designing a Cooling & Ventilation System.

The objective is to cool and ventilate a large volume building during the hot seasons, by lowering the inside temperature and by giving the necessary air changes to improve the internal environment. The lowering of the inside temperature will help to neutralize the heat build -up in the building structure, caused by solar gain and process equipment.

The air changes will help to eliminate; the stale air, fumes, vapours, smells, and various contaminants in the air that are often harmful to the health of employees.

To design the system there are four elements that must be considered:

1) **External summer conditions**
2) **Installation height of the air diffusers in the building**
3) **Number of air changes required depending on the type of activity in the building**
4) **Air evacuation openings**

9.1 External summer conditions

The ColdAIR evaporative cooling system works in a dynamic way based on a natural principle:

It introduces into the building large quantities of cooled external air and expels the stale warm air through doors, windows and other evacuation openings.

The temperature of the input air to the building varies dependent on the external air conditions, as per the following table

Relative Humidity		30%	40%	50%	60%	70%
External Air				Output Air °C		
20°C	°C	12	13.5	14.5	16	17
25°C	°C	16	17	18.5	20	21.5
30°C	°C	19	21	23	24.5	26
35°C	°C	22.5	25	27.5	29.5	31
40°C	°C	26	29	31.5	33.5	36.5

9.2 Air diffusers installation height in the building

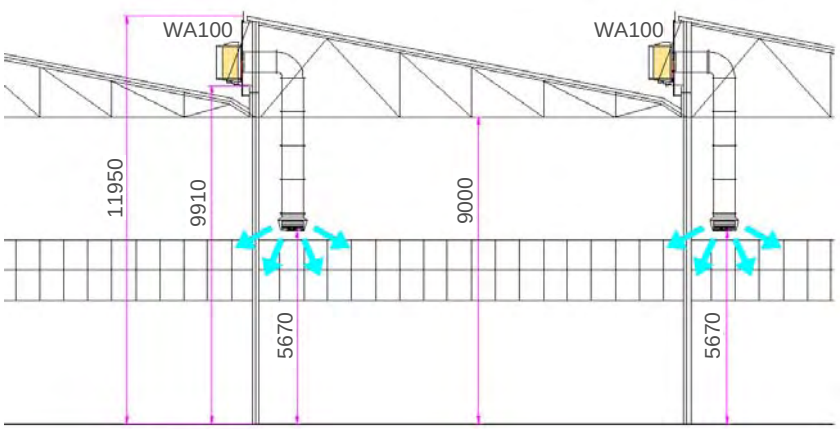
The cool air provided by the ColdAIR units tends to go to the floor and push the warmer air to high level.

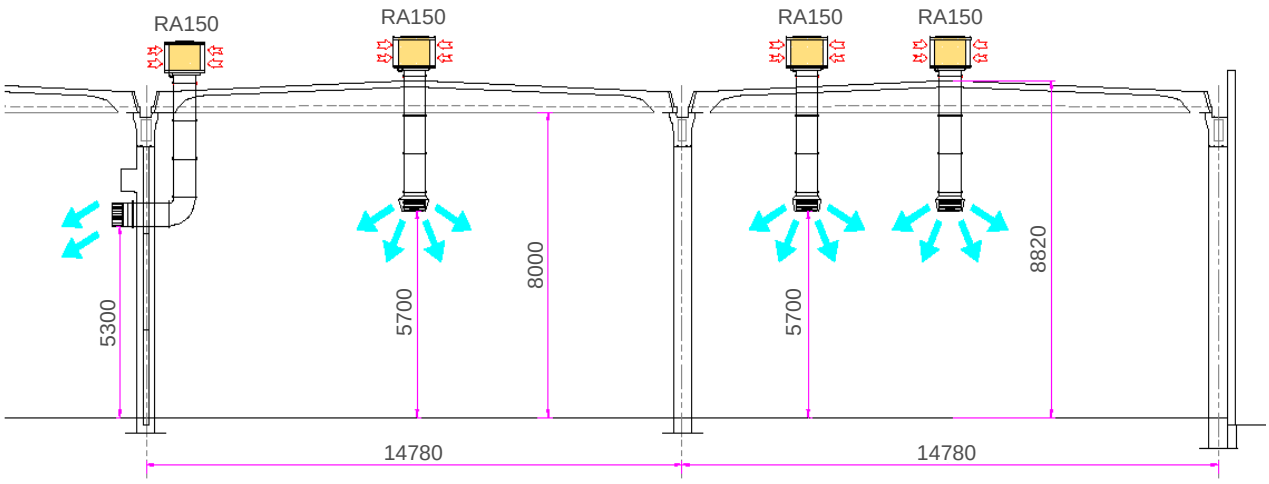
The area of consideration for cooling is where there are the workers, so the volume of air to be cooled is between the floor and a few meters high.

So as not to interfere with the working activity it is recommended that the air diffusers are installed no lower than 4 meters AFFL. It is also recommended not to install the air diffusers higher than 6 meters AFFL, to avoid unnecessary cooling of the upper part of the building

The higher the air diffusers are installed, the less the cooling effect will be in the working area.

The volume to be cooled is equal to: the surface area of the floor multiplied the height of the installed air diffusers.





9.3 Number of air changes required depending on the type of activity in the building.

Once the volume to be cooled is established, it is then multiplied by the number of air changes required, dependant on the type of activity. The result is the amount of input air that is required to provide the necessary air changes and cooling of the building internal environment.

The following table shows the minimum air change needed for different activities:

KITCHENS	20	vol.a/c per h
LAUNDRIES	10	vol.a/c per h
BATHROOMS	10	vol.a/c per h
NURSERY SCHOOLS, PRIMARY SCHOOLS	2.5	vol.a/c per h
INTERMEDIATE SCHOOLS	3.5	vol.a/c per h
SECONDARY SCHOOLS	5	vol.a/c per h
RESTAURANTS, DANCE HALLS, BILLIARDS HALLS, MEETING ROOMS	8	vol.a/c per h
CINEMAS, THEATRES	12	vol.a/c per h
WAREHOUSES (LIGHT MANUFACTURING)	10	vol.a/c per h
LABORATORIES	5	vol.a/c per h
PAINT SHOPS	45	vol.a/c per h
FOUNDRIES/WELDING	25	vol.a/c per h
FABRICATION/MACHINE SHOPS	15	vol.a/c per h
BAKERIES	25	vol.a/c per h
SPORTS HALLS	6	vol.a/c per h

9.4 Air evacuation openings

Once the required quantity of input air into the building has been established, it is necessary to calculate the dimensions of the openings to evacuate the stale air.

The ColdAIR cooling system requires that all the cooled input air to the building must be evacuated through natural openings or by forced air extraction.

The evacuation of the same amount of input air gives the required air changes, allowing the cooling effect and avoids the rise of the relative humidity in the building.

The air produced by the evaporative coolers contains a percentage of relative humidity; that is higher than the external air and that of the air in the building:

It is this characteristic that produces the cooling effect but, it must go through the building and exit from it. This results in; the percentage of relative humidity inside the building remaining stable and the effective cooling of the building.

To manage the evacuation of the air, it is required to have openings of 1m² for every 1,000 m³ of input air.

Therefore, if the need is to evacuate 10,000 m³ of air, the natural opening required will be 10m²

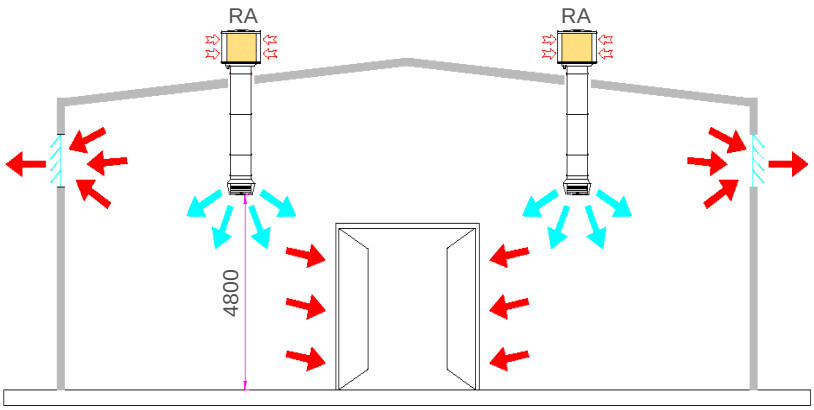
It is important that the openings (windows, doors, skylights…) are not all in one position or just at one side of the building. They should be distributed in various areas to allow the cooled air to pass throughout the building and not just to one side of it.

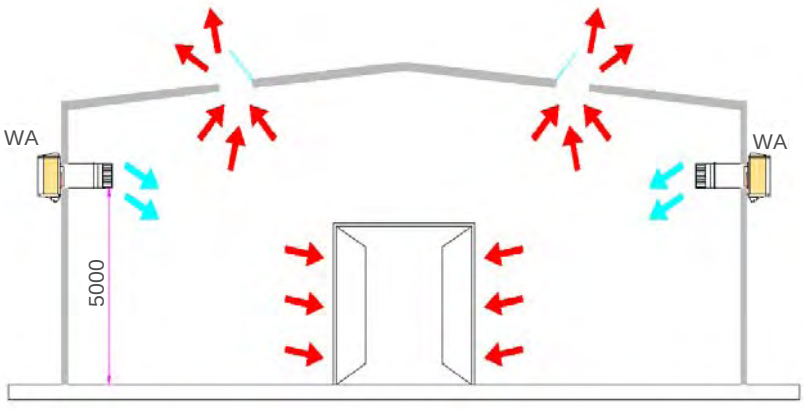
The best result is obtained when there are openings in the roof, as skylights or natural extractors: through these openings it is possible to evacuate the stale air that is underneath the roof which usually stays there for a long time.

WARNING: if the natural openings are greater than necessary for the evacuation of the air it could happen that some warm external air will be brought inside and limit the cooling effect.

If there are mechanical extracts, these must be considered in the calculation of the openings required for the evacuation of the air.

It is essential to ensure the correct balance between the input and evacuated air.





10. Types and Qty of Coolers to be Installed.

The choice of the model and number of coolers to be installed depends on the needs of the customer and on the different installation possibilities and air ducting, taking into account that the height of installation cannot be more than 6 meters from the ground.

The ideal installation is to position the cooler on the roof and enter through the skylight with the channel. In this case the RA models will be chosen for the installation on the roof.

In case the installation must be through a window or the wall, the WA model refers

The number of units to be installed depends on the volume of air required, and the design to give the best uniform distribution of the cooled air throughout the building. It is recommended not to opt for a design solution with one powerful unit but more units of less power.

EXAMPLE:

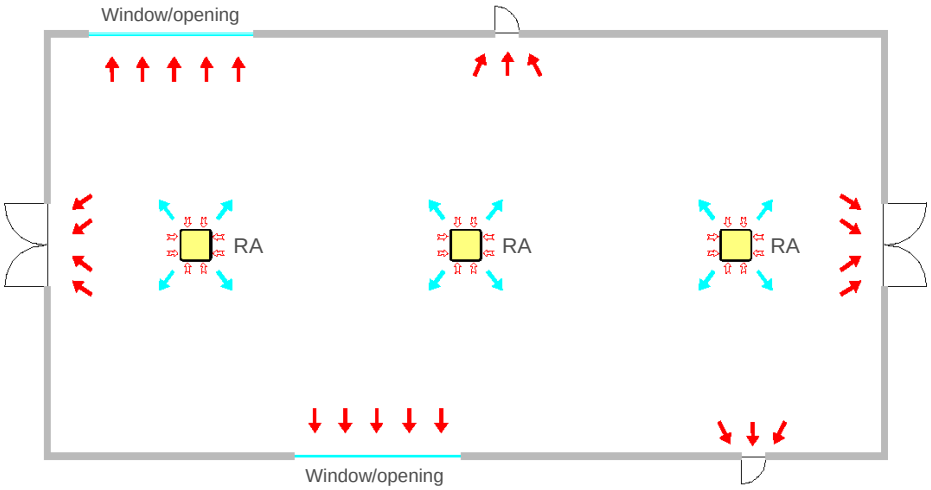
To cool; an industrial building of 800 m², installing the air diffusers at 5m AFFL. Volume of air to be cooled: 800 m² x 5 m = 4.000 m³.

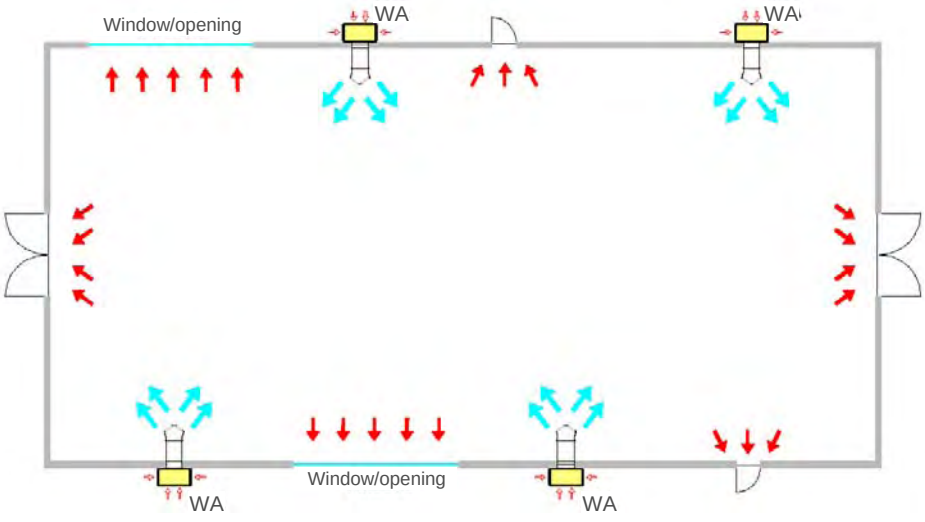
If the air change requirement is; 10 vol. a/c per h, the quantity of input air equates to: 40.000 m³/h.

Roof installation;
the models required will be the RA 150, with an air flow of 13.000 m³/h.
40,000/13,000 = **3 units.**

Window/wall installation; the models required will be the WA 100, with an air flow of 10.000 m³/h.
40,000/10,000 = **4 units.**

The openings required for the evacuation of the input air will be: (40,000m³/1,000m³) x1m² = **40m²**



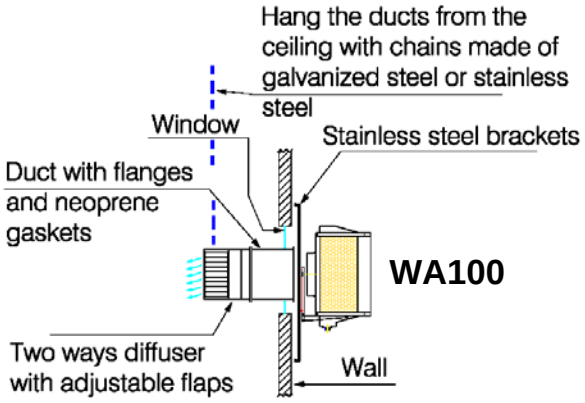


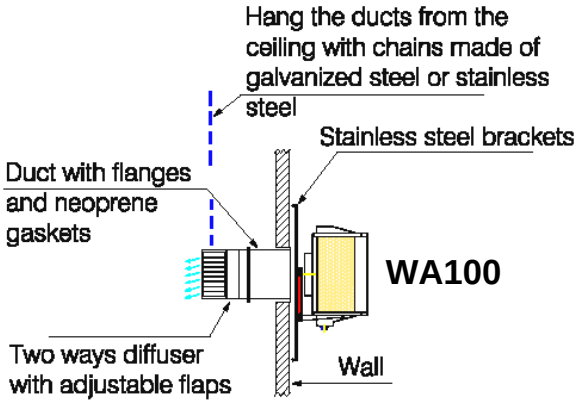
11. Evaporative Cooler Installation.

The installation of the ColdAIR evaporative cooler is very simple, and consists of fixing and positioning of the units, connection of the air ducts, the electrical and water supply and connection of the electronic controller.

Different types of installations are shown below

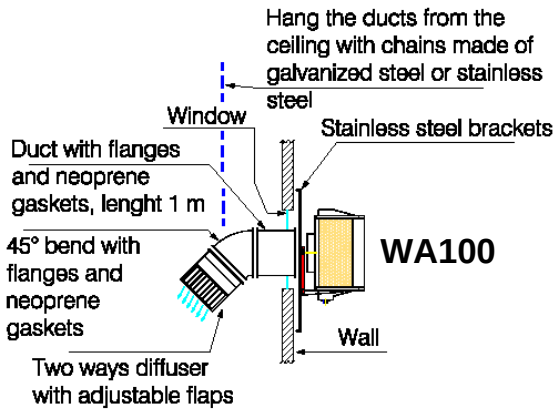
Window/wall installation, model WA

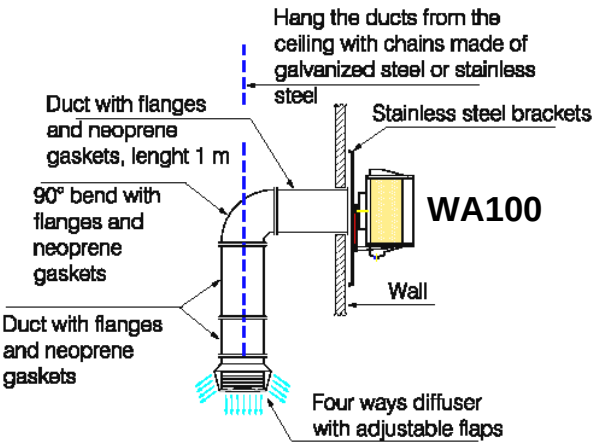




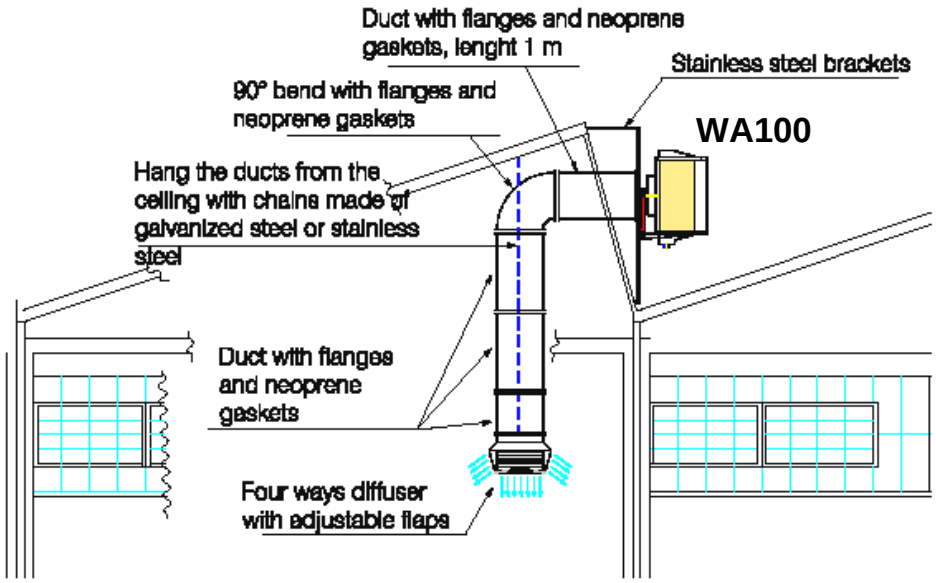






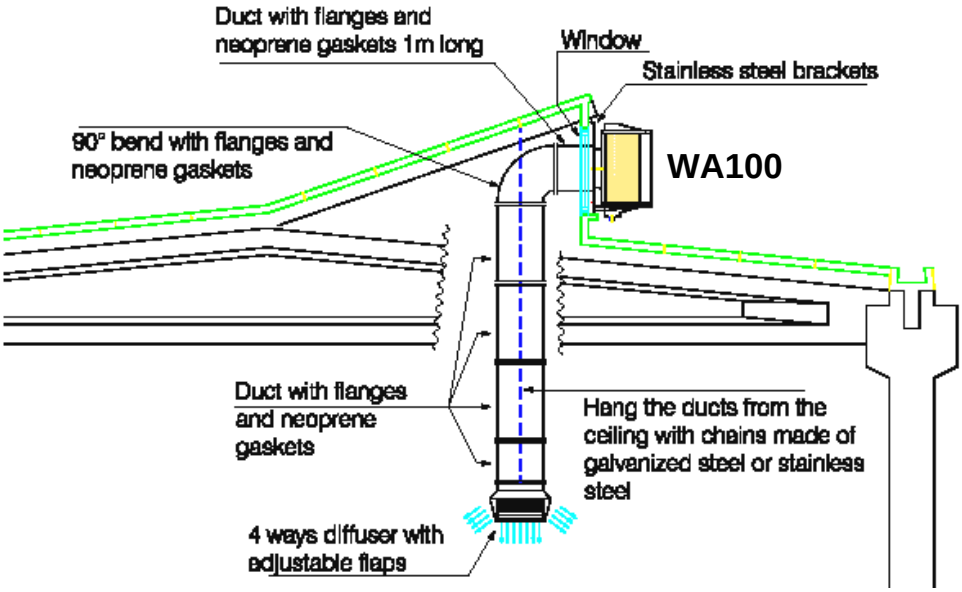


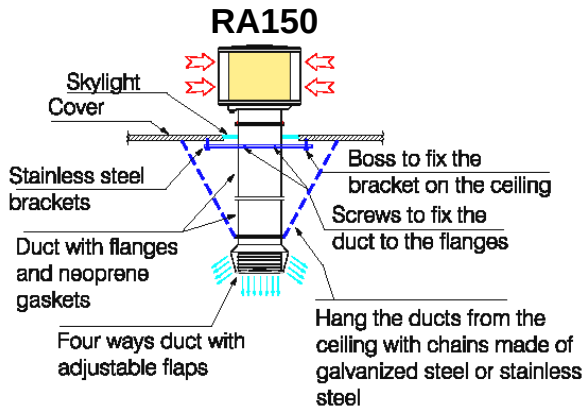
North light installation, model WA

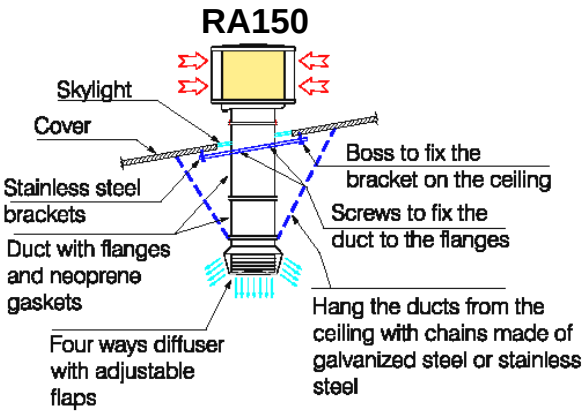






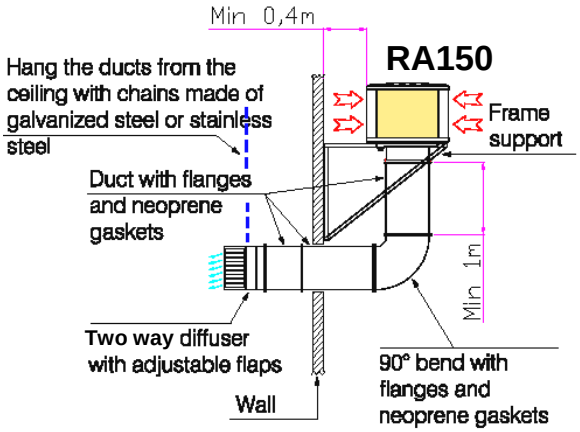


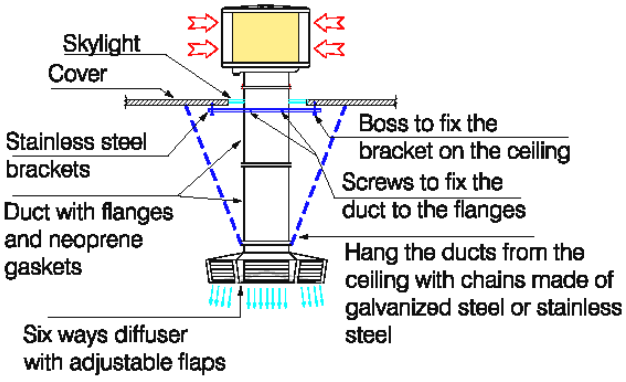

RA150
Skylight
Cover
Stainless steel
brackets
Duct with flanges
and neoprene
gaskets
Four ways duct with
adjustable flaps
Boss to fix the
bracket on the ceiling
Screws to fix the
duct to the flanges
Hang the ducts from the
ceiling with chains made of
galvanized steel or stainless
steel


RA150
Skylight
Cover
Stainless steel
brackets
Duct with flanges
and neoprene
gaskets
Four ways diffuser
with adjustable
flaps
Boss to fix the
bracket on the ceiling
Screws to fix the
duct to the flanges
Hang the ducts from the
ceiling with chains made of
galvanized steel or stainless
steel

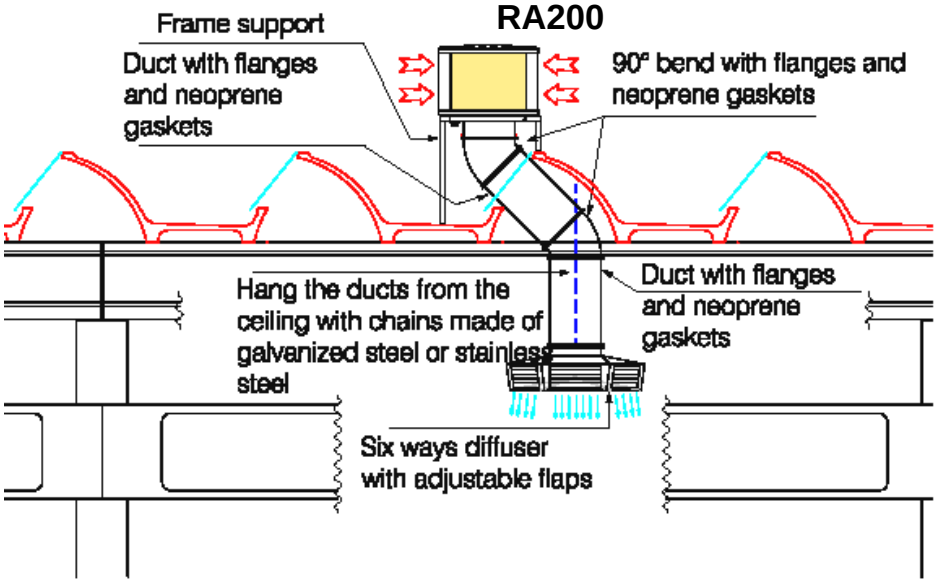





Min 0,4m
RA150
Hang the ducts from the
ceiling with chains made of
galvanized steel or stainless
steel
Duct with flanges
and neoprene
gaskets
Two way diffuser
with adjustable flaps
Wall
Frame
support
Min 1m
90° bend with
flanges and
neoprene gaskets


RA200
Skylight
Cover
Stainless steel
brackets
Duct with flanges
and neoprene
gaskets
Six ways diffuser
with adjustable flaps
Boss to fix the
bracket on the ceiling
Screws to fix the
duct to the flanges
Hang the ducts from the
ceiling with chains made of
galvanized steel or stainless
steel

RA200

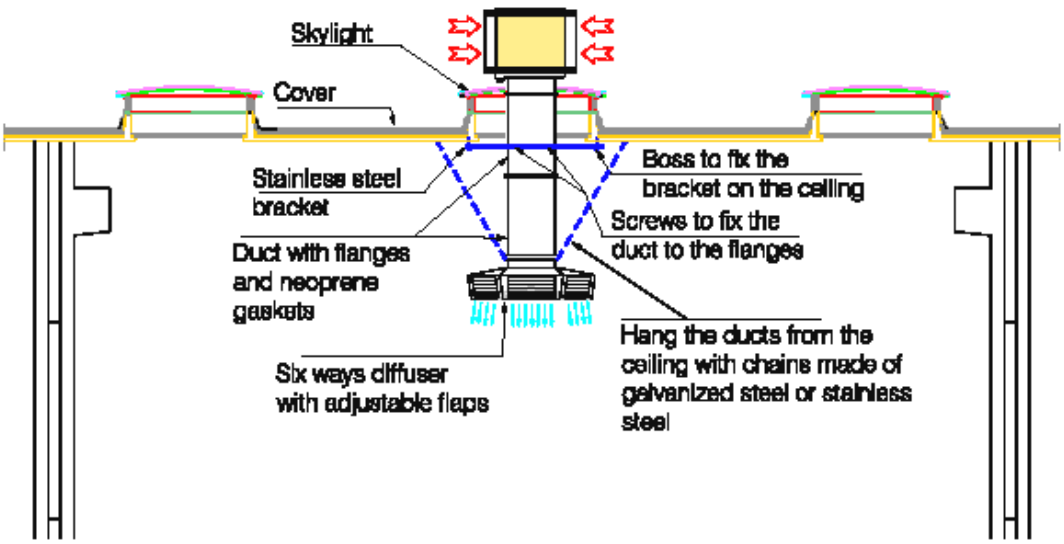

Frame support
Duct with flanges and neoprene gaskets
90° bend with flanges and neoprene gaskets
Hang the ducts from the ceiling with chains made of galvanized steel or stainless steel
Duct with flanges and neoprene gaskets
Six ways diffuser with adjustable flaps







RA200


Skylight
Cover
Stainless steel bracket
Duct with flanges and neoprene gaskets
Six ways diffuser with adjustable flaps
Boss to fix the bracket on the ceiling
Screws to fix the duct to the flanges
Hang the ducts from the ceiling with chains made of galvanized steel or stainless steel

12. Electrical and Water Supply Distribution.

12.1 Water supply distribution.

The water required for the ColdAIR evaporative cooler to function effectively must be drinkable and drawn directly from the mains water supply.

No special treatment of the water is required, as the cooler periodically automatically cleans the internal circuits to avoid the formation of lime scale and the crystallizing of minerals contained in water. If the water supplied is thought to be particularly “hard” it is possible to program more frequent automatic washes.

It is recommended to install the water supply distribution pipework inside the building to protect it from freezing in the winter and the sun rays in the summer; if it is not possible, then it is recommended to insulate the pipework.

The water supplied to the cooler must be calculated to produce a minimum capacity of 7 l/m and a pressure of 1.5 to 3 bar. (maximum pressure: 6 bar)

A filter must be installed in the water distribution pipework system to block the passing of any solid objects.

The ColdAIR evaporative cooler has a connection for the water supply pipework positioned on the lower part of the external structure of the unit.

It is recommended to install a service valve at the entrance of the unit and to connect to the water supply pipework with a stainless steel flexible pipe.

It is recommended to make provisions for the emptying of the water supply pipework before the beginning of the winter to avoid damage due to freezing.

The ColdAIR evaporative cooler has a tank connector on the bottom of the external structure of the unit to connect piping to drain the water at the end of the cycle.

For dimensions of the water connections and the water consumption data, refer to the technical data sheet (section 13)

12.2 Electrical supply distribution.

The ColdAIR evaporative cooler voltage supply is: 230V ~ 50 Hz (WA/RA) 415V~50Hz (RC).

The electrical supply distribution must be installed in accordance with the latest I.E.E Regulations The ColdAIR evaporative cooler must be connected to the electronic controller installed in a location, as agreed with the premises manager

Each cooler can be controlled independently or in groups up to a maximum of four units, by using the CABS system (ColdAIR Bus System), that controls up to four coolers connected in series through only one electronic controller.

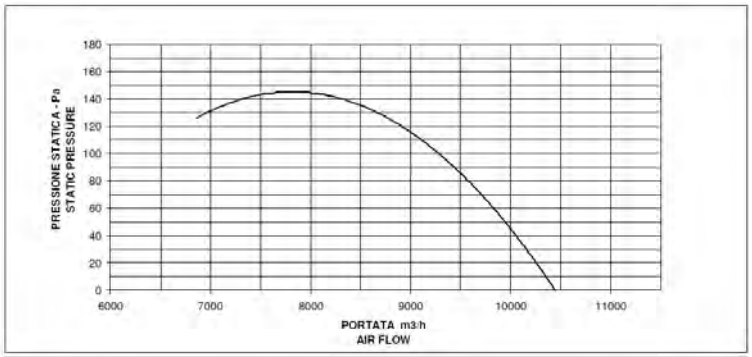
For electrical details of the ColdAIR evaporative coolers, refer to the technical data sheet (section 13)



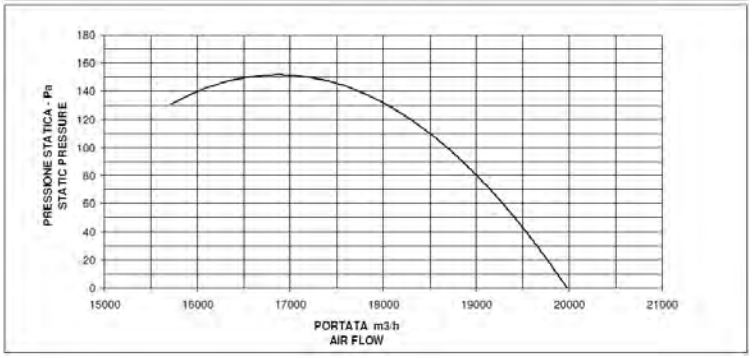


	Unit	WA 100	WA 150	RC 100	RA 150	RA 200	RC 200
Air Capacity Maximum Average Minimum	m^3/h	10000 7500 5000	13000 9700 6500	10000 - 5000	13000 9700 6500	20000 15000 10000	20000 - 10000
Cooling Capacity (1)	kW	15	19	15	19	30	36
Power Voltage	V	230V – 50Hz	230V - 50Hz	400V - 50Hz (3pha)	230V - 50Hz	230V - 50Hz	400V - 50Hz (3pha)
Current	amps	3.7	4.8	3.5	4.8	7.0	7.0
Power Consumption	kW	0.9	1.2	1.6	1.2	1.8	3.2
Water Consumption (avg)*	l/h	34	39	34	43	64	64
Water Inlet Ø	in	3/8	3/8	3/8	3/8	3/8	3/8
Water Outlet Ø	mm	60	60	60	60	60	60
Air Duct Size	mm	600 x 600	600 x 600	600 x 600	600 x 600	600 x 1150	850 x 470
Static Pressure	pa	n/a	n/a	80	n/a	n/a	80
Maximum Duct Length	m	5+1 bend	5+1 bend	See graph page 5	5+1 bend	5+1 bend	See graphs rear page
Humidification Panel: Thickness Surface Area Saturation Efficiency	 mm m^2 %	 100 2 88%	 100 2 88%	 100 2.7 88%	 100 2.7 88%	 100 3.4 88%	 100 3.4 88%
Dimensions : L x W X H	mm	1300 x 670 x 1300	1300 x 670 x 1300	1150 x 1150x 1050	1150 x 1150x 1050	1650 x 1150x 1050	1650 x 1150x 1050
Weight (empty - full)	kg	60 - 75	63 - 78	87 - 108	67 - 88	120 - 146	160 - 186
Noise Data Outdoor (2) Indoor	dBA	Min/Max speed 49 / 65 49 / 66	Min/Max speed 50 / 66 50 / 67	Min/Max speed 55 / 61 56 / 62	Min/Max speed 50 / 66 50 / 67	Min/Max speed 53 / 68 53 / 70	Min/Max speed 58 / 65 60 / 66

RC100 Fan Curve



RC200 Fan Curve



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