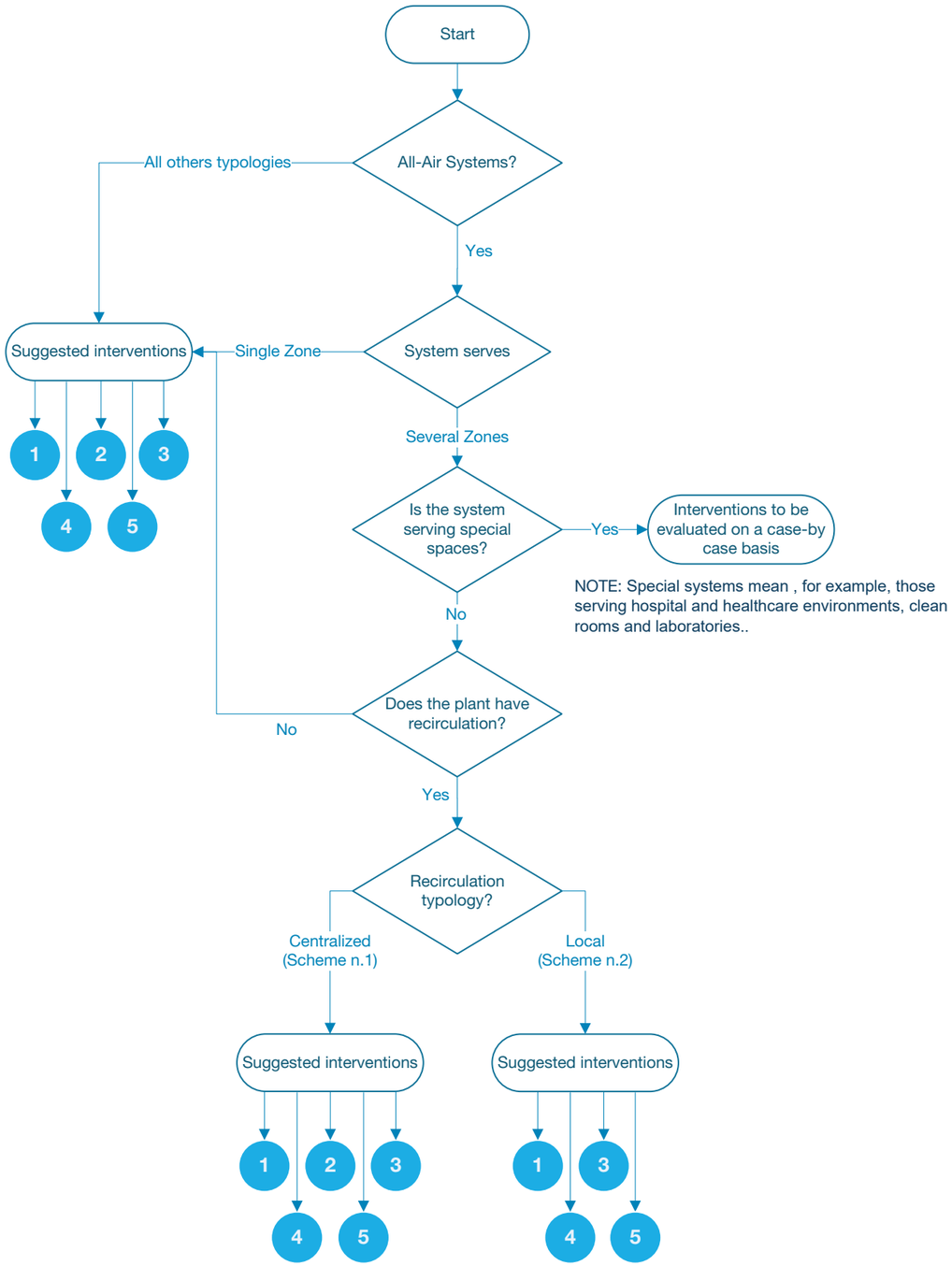
Cultura e Tecnica per Energia Uomo e Ambiente

PROTOCOL FOR RISK REDUCTION OF SARS-CoV2-19 DIFFUSION WITH THE AID OF EXISTING AIR CONDITIONING AND VENTILATION SYSTEMS



PREMISE

AiCARR deemed it necessary to produce a second document after that already published on 13 March 2020 on the association's website entitled HVAC PLANTS AND DIFFUSION OF SARS-CoV2-19 IN THE WORKPLACES.

This document is addressed to HVAC technicians for giving indications on how to operate existing systems, with the exception of special systems, such as those serving hospital and healthcare environments, clean rooms and laboratories.

Starting from the principle, widely shared by bodies responsible for supervising human health, that:

- the best action to limit any risk of COVID-19 infection by air is to ventilate indoor environments with outdoor air as much as possible;

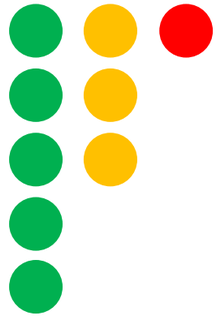
and by the fact that

- mechanical ventilation systems and air conditioning systems, which also provide ventilation, can perform this function more effectively than simply opening the windows, also because they improve the quality of the outdoor air with filtration;

AiCARR suggests some management operations that allow to maximize external air introduction into internal spaces according to existing systems specific type.

SUGGESTED INTERVENTIONS

1. INCREASE AIR FLOW
2. FORCE DAMPERS TO INTRODUCE OUTDOOR AIR ONLY
3. DEACTIVATION OR BY-PASS OF THE HEAT RECOVERY UNIT
4. KEEP THE RELATIVE HUMIDITY SETPOINT ABOVE 40%
5. VENTILATION CONTINUOS OPERATION (H24)



LEGENDA

- INTERVENTIONS THAT REQUIRE ACTIONS ON CONTROL SYSTEMS
- INTERVENTIONS THAT REQUIRE MAINTENANCE STAFF ACTIONS
- INTERVENTIONS THAT REQUIRE ORE MAY REQUIRE PLANT MODIFICATIONS

NOTE
Suggested corrective actions are those to be implemented on properly maintained and managed systems. At present there is no evidence that extraordinary plant sanitation should be carried out. It is recommended instead that maintenance and sanitation interventions, if carried out, always follow well-defined procedures and are performed by qualified personnel, equipped with suitable Personal Protective Equipment. Any intervention carried out incorrectly and / or without the use of PPE could result not in reduction, but in increase in risks.

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DESCRIPTION OF SUGGGESTED INTERVENTIONS

1 INCREASE AIR FLOW

It can be done by increasing the fan speed. In particular:

1) In fans equipped with inverters, increasing the supply frequency.

2) In fans equipped with belt and pulleys, changing the diameter of the pulleys.

Obviously, the intervention must concern both the external air supply fan and the exhaust air return fan, being careful to keep the pressure difference in the individual rooms unchanged (if in overpressure, they must remain in this state. The operation in depression mainly concerns special systems, which must be examined on a case-by-case basis).

In any case, care must be taken that the actual fan motor power input do not exceed the maximum allowed power input.

2 FORCE DAMPERS TO INTRODUCE OUTDOOR AIR ONLY

For the sole purpose of increasing the external air flow, it is advisable to close the recirculation damper and at the same time open the outdoor air and exhaust air dampers, taking care not to alter the pre-existing overpressure conditions.

For systems designed to be able to operate with all external air, for example free-cooling (Scheme n.1), only external air mode is recommended, providing for total closure of the recirculation damper and simultaneous opening of both outdoor and exhaust air dampers.

For systems that do not provide free-cooling (Scheme n.1), it is still advisable to close recirculation damper and simultaneously open both outdoor and exhaust air dampers. The fan flow rate will be reduced, but it will consist of only outdoor air. Care must be taken avoiding that fan is going to work at points of instability. In such case, fan speed must be lowered, either by acting on inverter frequency, if present, or by varying the pulleys diameter.

For packaged direct expansion systems with partial free-cooling, for example roof tops, it is necessary to carefully check what are the minimum allowed flow rates and outdoor air percentage to be introduced to avoid blocking the refrigerant circuit operation.

3 DEACTIVATION OR BY-PASS OF HEAT RECOVERY UNIT

The rotary heat exchangers must always be stopped, to avoid a possible, however improbable and remote, contamination of the air introduced. Upon restarting, the wheel must first be sanitized.

For the same reason, any other type of enthalpy heat exchangers must be by-passed. For cross-flow heat exchangers, it is advisable to evaluate by-pass' opening in order to increase the outdoor air flow. If there is a calibration damper on the outdoor air by-pass line, designed to produce the same the pressure drops of the heat exchangers, such damper must be opened as much as possible, without exceeding the maximum allowable motor input power.

4 KEEP RELATIVE HUMIDITY SETPOINT ABOVE 40%

It is well known that low relative humidity values make mucous membranes dry, reducing their barrier function to viruses.

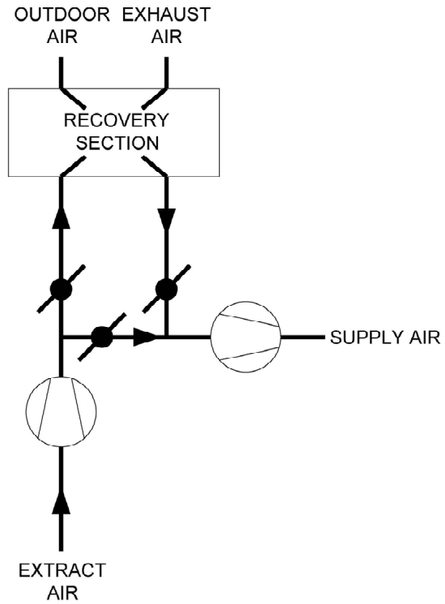
Therefore, in winter operation, air must be kept at least 40% relative humidity. If humidification is needed and the system is not equipped with a humidification system, use of local humidifiers must be evaluated taking into account the climatic conditions.

In summer, the problem of low relative humidity should never arise. Should this occur, it is advisable to act by increasing the minimum saturation temperature, that is, the temperature set-point of cooling coil outlet fluid. In general, in hydronic systems it is appropriate to adjust the set-point temperature of the water leaving the refrigeration unit; in direct expansion systems, the evaporation temperature should be appropriately adjusted.

5 VENTILATION CONTINUOUS OPERATION (H24)

Although there is no evidence that introducing outdoor air even during off-hours helps reduce the risk of contracting the virus, the precautionary principle suggests doing so. Continuous operation on a daily basis ensures that indoor air is at outdoor air conditions when the premises are reopened.

NOTES TO SCHEMES 1 AND 2

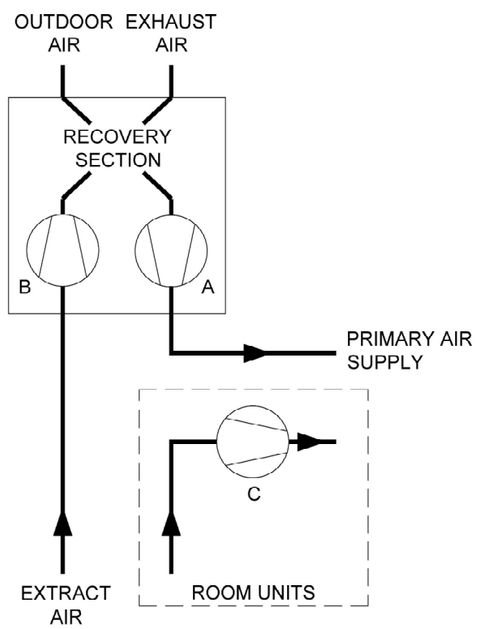


ALL-AIR SYSTEMS WITH CENTRALIZED RECIRCULATION (SCHEME N.1)

This is the typical case of many large all-air systems with recirculation. The return fan is located upstream of the recirculation connection. There are two configurations:

1) *Systems designed taking into account a possible operation in free-cooling mode*: sizing of exhaust and extract air ducts is made on the maximum system air flow; dampers are always conjugated and motorized.

2) *Systems designed without operation in free-cooling mode*: sizing of outdoor and extract air ducts is carried out on the outdoor air flow rate only. In older systems, dampers are manually calibrated and non conjugated to each other. In more recent systems, dampers may be motorized and conjugated, to allow variation of outdoor air flow according to actual occupancy, but they may have a manual lock to prevent the complete closure of the recirculation by-pass. This block must be removed, to carry out what is suggested in intervention n. 2.



PRIMARY AIR SYSTEMS WITH ROOM OR ZONE UNITS (SCHEME N.2)

This is the typical case of new VMC systems built according ERP 2016 or ERP 2018 prescriptions.

Outdoor air flow rate depends only on the two fans present in the heat recovery unit, A and B in the diagram.

The third fan, C, is used only for system operation and does not contribute in increasing the external air flow rate.