Appendix A
CERN instructions on COVID-19-related health and safety measures:
COVID-19 related HVAC instructions

These instructions concern Heating, Ventilation and Air Conditioning (HVAC) of indoor spaces and are applicable to all surface buildings. They complement the instructions on the use of office space, meeting rooms, laboratories and workshops under COVID-19 conditions.

The measures set out herein shall be implemented as a protection against COVID-19 and insofar as they are compatible with other health and safety risks present in the space concerned and the corresponding mitigation measures. In case of incompatibility a risk assessment shall determine the appropriate mitigation measures for all health and safety risks present in the space concerned.

1. **General HVAC-related instructions** (applicable to e.g. offices and meetings rooms)

   a) Indoor spaces have to be vented as much as possible, at least every 2 hours for 10 minutes, with fresh air. A circulation or ‘draft’ of fresh air has to be assured either by natural or mechanical means. Natural air circulation is achieved by two opposite openings such as windows and doors to create an air circulation. The venting of the offices has to be supported by simultaneous venting of the corridors, i.e. by keeping the entrance doors into the corridors and the buildings open. In case the outdoor air temperature is equal or higher than the one indoors, additional means such as office fans have to be added to ensure the supply of fresh air via an open window (see illustration in Figure 1). The workplace layout shall be such that the person(s) are not directly exposed to the air draft;

   ![Diagram](image)

   *Figure 1 – Examples of efficient natural ventilation in offices.*
   a) with favorable outdoor conditions, b) with the aid of office fans for unfavorable outdoor conditions

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1 Ambient outdoor air that enters a building through openings and/or ventilation system
A specific assessment is required in case the openings (windows, doors) do not face each other, but are installed under an angle, e.g. under 90 degree.

b) HVAC systems supplying fresh air in indoor spaces (i.e. mechanical ventilation) shall be kept on 24/7;

c) Pure recirculation A/C units for comfort (e.g. office-type split A/C) are not allowed (see illustration in Figure 2);

**Systems to Cool the Indoor Air**

![Illustration of HVAC systems](image)

*Figure 2 – Typical refrigeration systems for cooling of indoor air*

d) Mechanical extraction of toilet facilities shall be kept on 24/7. In the absence of a mechanical extraction, at least windows and doors need to be kept open. In addition, the toilets shall be flushed with the lid closed.

2. **Specific HVAC related instructions** (applicable to e.g. laboratories, workshops, clean rooms)

**Category 1**

No additional measures need to be taken for indoor spaces equipped with following HVAC systems:

- Full fresh air supply, i.e. 100% of the air supplied into the space is fresh air, or
- Equipped with HEPA filtration and an air exchange rate per hour of 10 or higher.

**Category 2 - Partial supply of fresh air**

The majority of the indoor spaces equipped with mechanical ventilation are supplied with an amount of fresh air ranging from 10 to 30 %, i.e. the rest of the air volume is recirculated. For these situations, the instructions are:
• Allow a maximum occupancy of 1 person per 20 m³ (example in ), and
• Ensure a decay period of at least two to three hours in between the access of two different occupants or work shifts

**Category 3 – Full recirculation**
In spaces that are temporarily or permanently ventilated with 100% recirculation, the instructions are:
• Define an access procedure to minimize the amount of occupants simultaneously present in the room;
• Organise the workplaces so that the occupant’s face or back is not facing the air flow steam of the recirculation unit (e.g. A/C split);
• Use of FFP2 masks (without exhalation valve) for an occupancy rate up to 1 person per 40 m³. In case of single occupancy of rooms with volumes of less than 20 m³ FFP2 masks must be worn if a decay period of at least two to three hours cannot be respected before the access of another occupant. Only a fit check is required for the use of FFP2 masks that are exclusively worn for COVID-19 risk mitigation – the instructions are listed in Figure 3.

![Fitting instructions](image)

1. Cup the respirator in your hand with the nosepiece at your fingertips allowing the headbands to hang freely below your hand.
2. Position the respirator under your chin with the nosepiece up. Pull the top strap over your head resting it high at the top back of your head.
3. a) Pull the bottom strap over your head and position it around the neck below the ears. b) Make sure that the straps are not twisted.
4. Place the fingertips of both hands at the top of the metal nosepiece. Mould the nosepiece to the shape of your nose by pushing inward while moving your fingertips down both sides of the nosepiece. Pinching the nosepiece using one hand may result in less effective respirator performance (see fit check procedure).
5. The seal of the respirator on the face should be fit checked prior to wearing in the work area.

![Fit check procedure](image)

- a) Cover the front of the respirator with both hands, being careful not to disturb the position of the respirator.
- b) Exhale sharply. A positive pressure should be felt inside the respirator. If air leaks around the nose, readjust the noseclip as described in step 4 of the fitting instructions to eliminate leakage. Repeat the above fit check. If air leaks at the respirator edges, work the straps back along the sides of the head to eliminate leakage. Retest the seal. Repeat the procedure until the respirator fits properly.

**Note:** Do not use with beards or other facial hair that may inhibit contact between the face and the edge of the respirator.

If the general and/or specific instructions cannot be met, compensatory measures shall be established based on a case-by-case risk assessment, in consultation with the HSE Unit and the Organic Unit in charge of the HVAC equipment.

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2 Example: a lab with 48 m² and a ceiling height of 2.5m, the total volume of the space is 120 m³. Hence, the recommended maximum occupancy is 6. Values, based on a surface area of 8 m²/person.

3 \( T_{1/2} \) (virus in air) = 1.2 h, \( T_W = 2 \) h => 69 % reduction of virus in air, \( T_W = 3 \) h => 82 % reduction of virus in air