Buildings & Technical Services Section

VENTILATION AND AIR-CONDITIONING STANDARD

CONTENTS

1. GENERAL

Studies relating to the installation of ventilation and air-conditioning systems must take account of the parameters linked to the extreme weather conditions in the Geneva region.

Companies must submit, with their bids, all technical information relating to the design of the system concerned, as required in the Specifications document (Section 17, Submission of the Bid).

The type of equipment used in performing the work must be that described in the standardisation of the equipment. Any changes made will be subject to the approval of UNOG technical services.

The company must supply its site with materials and equipment that are finished or ready-to-install (ducts, pipes, monoblock units, etc.). No manufacture will be permitted on the UNOG site. The company must notify UNOG technical services of all hot work (welding, grinding, cutting, etc.) so that fire permits can be issued.

The technical study must take account of the environment and the necessary space available. All elements must be positioned in such a way that they can be easily removed or replaced.

The various chambers of the monoblock unit must be fitted with low-energy interior lighting, with controls outside the unit.

Each ventilation unit must be fitted with a lockable servicing switch.

Other standards must be used for the installation of ventilation and air-conditioning systems (electrical standards, pipe insulation standards, pipe and control standards).

2. DUCTS, AIR VENTS, VALVES

2.1 General

All ducts must be made from galvanised sheet metal and fitted with removable access hatches, Spiro brand or equivalent, located close to check valves, terminal coils and on the linear parts of the ducts. To ensure the airtightness of the Métu frames, clips spaced no more than 300 mm apart must be placed over each join. Unless otherwise specified, the thicknesses of the duct sheet metal must be as follows:

Rectangular ducts:	Up to 700 mm:	0.70 mm
	From 700 to 1300 mm:	0.90 mm
	Over 1301 mm:	1.10 mm
Circular or Spiro ducts:	Up to Ø 200 mm:	0.45 mm
	From 225 mm to 500 mm:	0.62 mm
	From 500 mm to 1000 mm:	0.80 mm
	From 1000 mm to 1600 mm:	1.00 mm

2.2 Supply ducts

Supply ducts may be cylindrical (Spiro), square or rectangular. The shape must be suitable for the available passage volume and for the air flow to be conveyed. Structured-type ducts with reinforcing strips must be used for high-pressure systems (air speed greater than 10 m/s) and unstructured ducts for low-pressure systems (air speed less than 10 m/s). The permissible air speed must not exceed 4 m/s for conference rooms and 3 m/s for interpreting booths. Generally speaking, the air speed must not exceed 3 m/s for systems in which the air flow rate is less than 1000 m3/h, 4 m/s up to 2000 m3/h, 5 m/s up to 4000 m3/h, 6 m/s up to 10 000 m3/h and 7 m/s over 10 000 m3/h. These figures also apply to return and extraction ducts.

A sound absorber must be always installed as close as possible to the monoblock unit. The joins between the various duct components must be made using Métu frames and rendered airtight using seals or silicone sealant.
Supply and fresh air ducts must be insulated on the outside using a thermal insulation blanket of compressed rock wool 25 mm thick, covered with a sheet of aluminium vapour barrier. The elements must be joined using aluminium foil tape. Under no circumstances may the ends of the nails holding the insulation blanket onto square or rectangular ducts create a hazard of any kind. The insulation blanket must be held in place on circular ducts using galvanised wire. Insulation sheaths must be held in place using a galvanised steel mesh for all sections below 2.50 m. It is also possible to install thin-layer NEST insulation made by Winco Technologies, which has the same insulating characteristics as 25 mm thick compressed rock wool, in tight spaces where installing rock wool is not possible. This solution must be submitted to UNOG technical services for approval. The supply ducts must be connected to the monoblock unit using flexible, removable, airtight sleeves, and equipotential bonding must be performed. A dial thermometer with a scale corresponding to the temperatures of the conveyed air must be installed on the supply air ducts, close to the monoblock unit. The supply ducts must be attached using silent blocks to prevent the transmission of any vibrations. Sound absorbers must be installed to minimise noise pollution in the ventilated rooms.

2.3 Return and extraction ducts

Return or extraction ducts may be cylindrical (Spiro), square or rectangular. The cross-section and shape of the ducts must be defined based on the available space and the air flow to be conveyed. Structured-type ducts with reinforcing strips must be used for high-pressure systems (air speed greater than 10 m/s) and unstructured ducts for low-pressure systems (air speed less than 10 m/s). The permissible air speed must not exceed 4 m/s for conference rooms and 3 m/s for interpreting booths. A sound absorber must be always installed as close as possible to the monoblock unit. The joins between the various duct components must be rendered airtight using seals or silicone sealant. The supply ducts must be connected to the monoblock unit using flexible, removable, airtight sleeves, and equipotential bonding must be performed. Dial thermometers with scales corresponding to the temperatures of the conveyed air must be installed on the return air and extracted air ducts, close to the monoblock unit. Return air and extracted air ducts will not be insulated for conveyed air temperatures greater than 16 °C. Sound absorbers must be installed to minimise noise pollution in the ventilated rooms.

3. MONOBLOCK UNITS

The proposed air handling units must be chosen from among the brands BOSCH, SEVENAIR and DEPAIR. The selected models must be submitted to UNOG for approval. The monoblock units must be fixed to the floor with height-adjustable feet, and fitted with appropriate silent blocks to prevent the transmission of any vibrations. The units must be joined to the supply and return air ducts with flexible, removable, airtight sleeves. Equipotential bonding must be performed between the monoblock unit and the metal ducts. Condensate flow must be through a Geberit tube; a trap must be installed at the monoblock unit outlet. The design of this trap must take account of the vacuum. The monoblock units must be fitted with stainless steel or polypropylene droplet guards.
Access to the various pieces of equipment in the monoblock unit must be possible via removable panels or hinged doors. A removable protective housing must be installed over the belt drives in the case of an access hatch which does not require the use of tools to remove the panel or access door. Each monoblock unit must be identified using a rigid label in A4 format, with white writing on a black background. The text will be supplied by UNOG technical services.

3.1 Motorised fans

- The fans installed in monoblock units with a flow rate of less than 5000 m^3/h and 500 Pa must be forward-inclined fans;
- The fans installed in monoblock units with a flow rate of more than 5000 m^3/h and 500 Pa must be backward-inclined fans;
- For systems with medium-to-low flow rates, the transmission must be direct; belt drives are reserved for high-flow-rate systems;

- Where double turbines are used, no bearings are permitted to be installed between the two turbines;
- Bearings must be installed on support frames, not suspended;
- The frame supporting the motorised fan units must be made from stainless steel, hot-dip galvanised steel or aluminium. Attachment to the monoblock chamber must use appropriate silent blocks to prevent the transmission of any vibrations;
- Where belt drives are used, the motor must be fixed to an adjustable bracket enabling easy tensioning and alignment of the belt;
- Two-speed motors must be fitted with separate windings;
- The motors may be powered by variable frequency drives;
- The current absorbed by the motor must be 10 % less than the rated current of the motor, at the maximum air flow rate of the system;
- A spare set of belts must be supplied.
- The noise generated must not exceed 42 dBa for conference rooms and 35 dBa for interpreting booths.

3.2 Dampers

- Fresh air, recycled air and extraction dampers must be airtight, made from hot-dip galvanised sheet metal, with opposed blade couplings;
- Manually-adjusted dampers must be mechanically locked.

3.3 Heating and cooling coils

- The face velocity on the heating coils must not exceed 3.5 m/s;
- The face velocity on the cooling coils must not exceed 2.5 m/s;
- The operating pressure for the heating and cooling coils is 6 bar; the test pressure must be 10 bar;
- The heating and cooling coils must be made from copper tubing of minimum thickness of 0.4 mm, with aluminium fins;
- The cooling coils must be designed for water at a temperature of 12/16 °C;
- The heating coils must be designed for water at a temperature of 50/40 °C;
- The maximum pressure loss from passage through each coil must be 100 Pa for heating coils and 200 Pa for cooling coils;
- A slide valve supporting the frost-protection thermostat capillary (setting: +5 °C) must be installed between the pre-heating and cooling coils.

4. FILTRATION

Pre-filtration of fresh air must be provided in the new monoblock units if not already installed in the fresh air inlet. Pre-filtration must be performed by M6 pocket filters. Filtration must be performed by F7 fine pocket filters. The choice of filter must be based on the following criteria:

- Filtering area;
- Filter pressure loss, both when the filter is clean and with the maximum tolerated level of clogging;
- Dust retention capacity.

Filters and pre-filters must be mounted on sliding tracks for ease of replacement. The filters installed must comply with the testing standard, EN779: 2011.
A differential pressure switch to signal clogging must be installed for each row of filters.

A spare set of filters and pre-filters must be supplied.

5. CONTROL

Control of the air handling units is via a centralised technical management system running Johnson Controls Métasys software. The air handling units are controlled by FEC, DX 9100 or TC 9100 digital controllers. The list of control components must be submitted to UNOG technical services for approval.

5.1 Control loops

All points of the control loops are “fed back” to the monitoring screen, including curve setting points. In principle there should be 4 setting points per curve, or more if specified in the call for tenders. All elements relating to control monitoring and management must appear on the monitoring screen (see Section 7): the commands, set points, sensors, adjustment devices, valves, servomotors, thermostats, operating and fault indicators, feedback of open/closed states of shut-off valves or fire dampers, and all operating discrepancies of the system.
Since the specific details are different for each project, these details will be set out in the Specifications document.

5.2 Monitoring screens

These are based on Johnson Control “Métasys graphique” software, or another software specified in the call for tenders. The photos in Section 7 show the standard screens used at the Palace of Nations in Geneva.

5.3 Control equipment

- Network controllers NAE 55 xxxx:	Johnson Controls
- Programmable logic controllers and regulators:	Johnson Controls
- Pneumatic valve motors with or without positioners	Johnson Controls
- Electric motors, 24 VAC with 0-10 V signal:	Johnson Controls
- Active analogue sensors with 0-10 V or 4-20 mA signal:	Johnson Controls
- Variable-flow mixing boxes:	Trox
- Fire damper servomotors	Bellimo
- Variable frequency drives for electric motors:	Schneider Electric, type Altivar 61.
- Soft starters for electric motors:	Schneider Electric

The other control components are defined in the electrical standards.
Shut-off valves must be fitted with position limit switches indicating when the valves are open and closed.

6. PERFORMANCE

6.1 Pressure losses

The permissible pressure losses for each piece of equipment must not exceed the values shown below in Pascals (Pa):

- Grilles, automatic dampers, rain flaps*: 20-40 Pa;
- Closure shutters*: 10-20 Pa;
- Heating and cooling coils, heat exchangers*: 100-200 Pa;
- Clean filters*: 40-60 Pa;
- Clogged filters: 250-300 Pa;
- Silencers, sound absorbers*: 40-80 Pa;
- Ventilation outlets*: 10-200 Pa;
- Cyclone separators: 500-750 Pa.

* *The exact values are specified in the technical documentation for each product.*

The exact data given by the manufacturers must be used when calculating the air flow rates and performance of each system.

6.2 Air conditioning in operators' booths

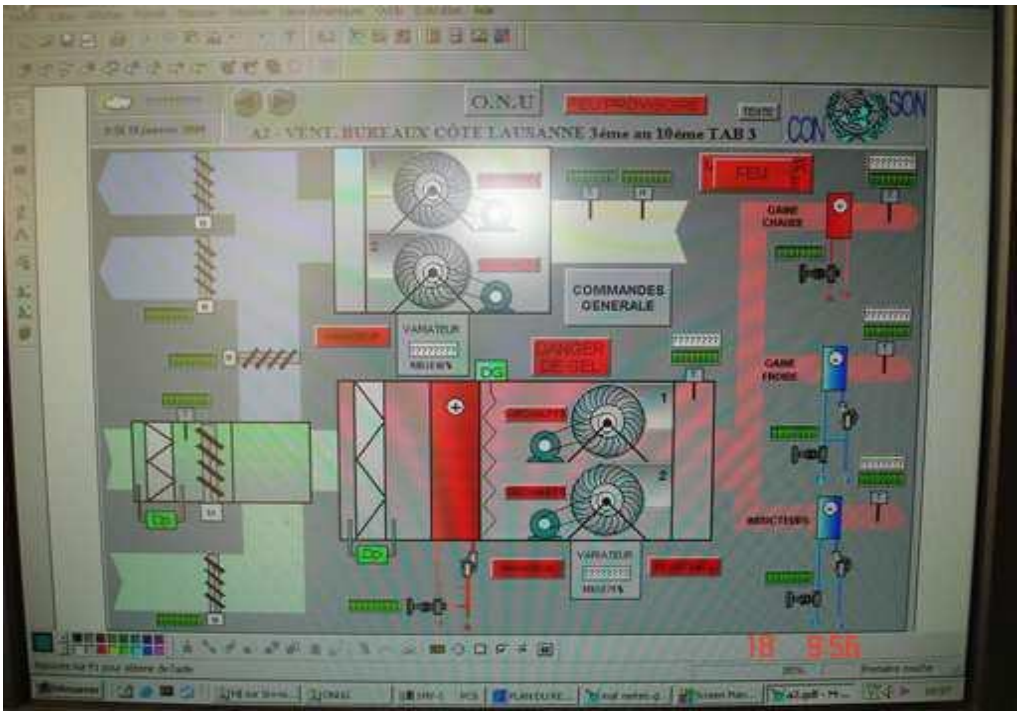
The air-conditioning systems for the interpreters' booths must be designed in compliance with the requirements of the ISO 2603 standard concerning fixed interpreting booths.

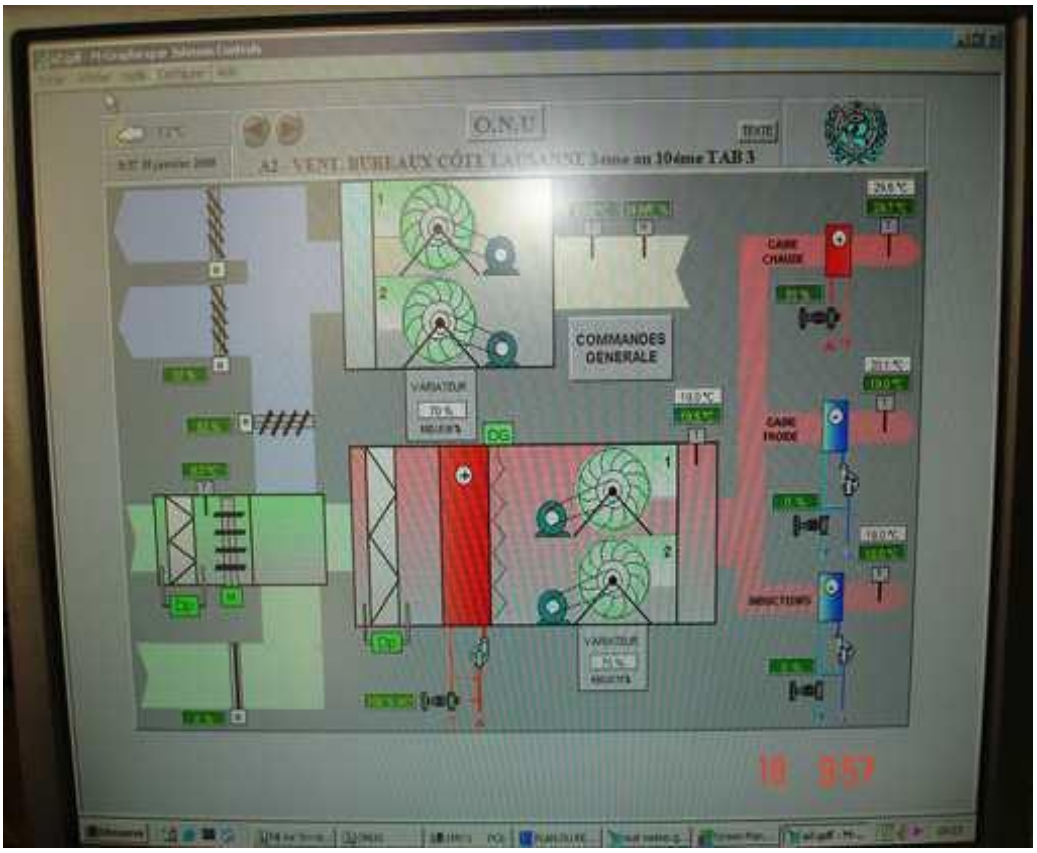
The requirements include:

- The booths must be air-conditioned with 100 % fresh air;
- The air-conditioning system for the booths must be completely independent of the rest of the building and of the conference room;
- The noise generated in each booth must not exceed 35 dBa;

- The air renewal must be greater than 7 times the volume of each booth per hour;
- A manual shutter over the supply duct must allow adjustment of the air flows in each booth;
- It must be possible to adjust the temperature in each booth between 18 °C and 22 °C via an individual adjustable sensor placed in each booth;
- The supply will be created by excess pressure in the perforated false ceilings; an excess pressure of 10 % will be necessary for each booth;
- Extraction will be carried out either through adjustable vents situated at the bottom of the walls on either side of the door, or on the ceiling at the entrance to the booth using soundproofed adjustable vacuum valves;
- To prevent noise transmission, supply and extraction ducts must not pass from one booth to the next.

7. PHOTOS OF MONITORING SCREENS (NOT CONTRACTUALLY BINDING)

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VARIATEUR
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INJECTEURS
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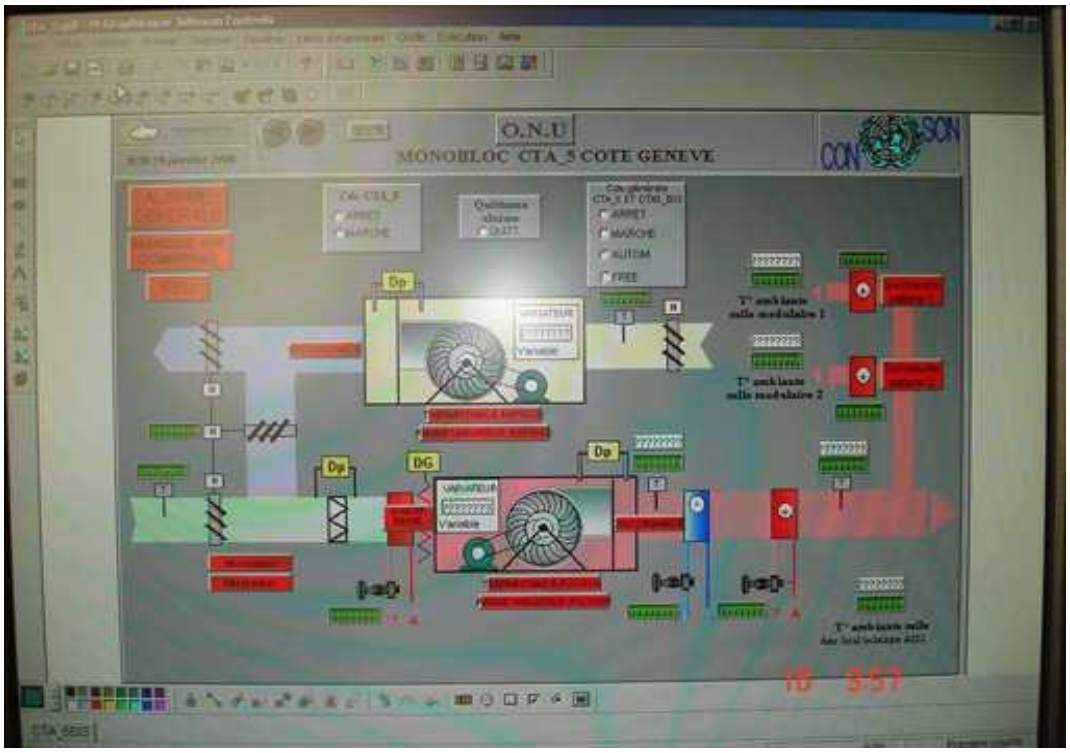
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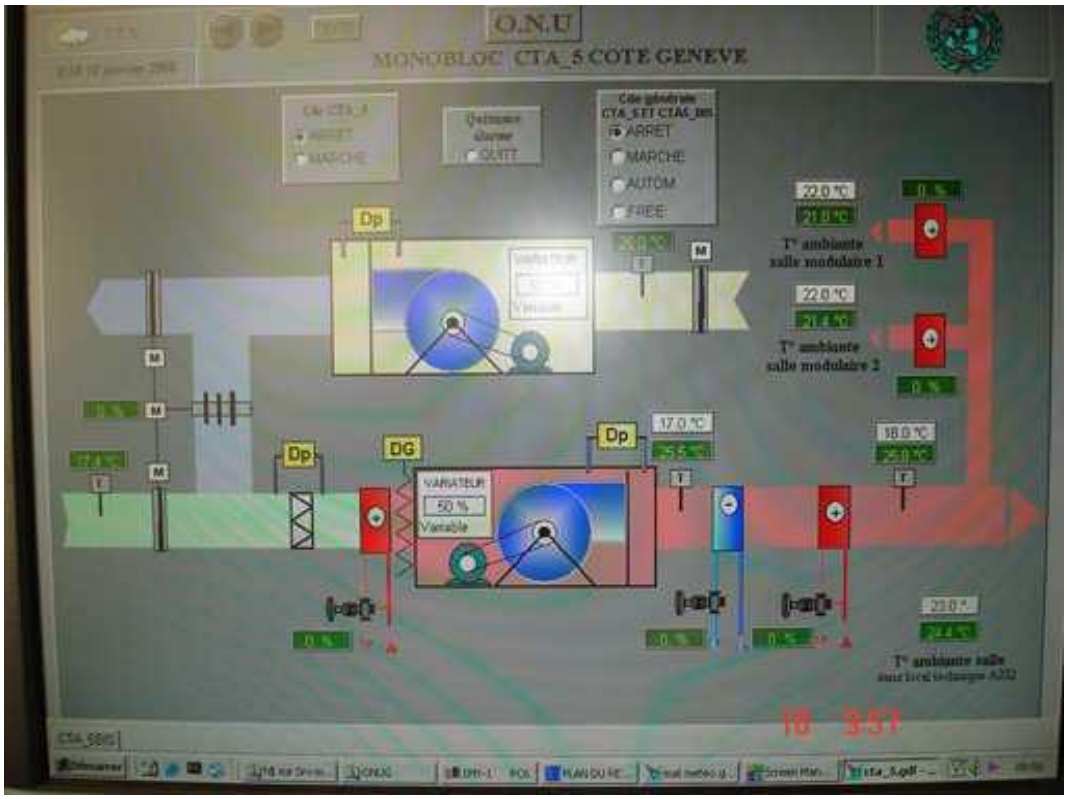
MONOBLOC CTA_5 COTE GENEVE
Dp
DG
VARIATEUR


O.N.U
MONOBLOC CTA_5 COTE GENEVE
ARRÊT
MARCHE
AUTOM
FREE
Dp
DG
VARIATEUR
50 %
Variable
T° ambiante salle modulaire 1
T° ambiante salle modulaire 2
T° ambiante salle

8. COMMISSIONING LOG

The commissioning card for the ventilation and air-conditioning systems must be included in the technical documents supplied at the time of provisional acceptance of the system concerned. The commissioning card must be adapted for each type of system and must contain at least the following values:

Supply motor

Rated current: Absorbed current:
Protection setting value:

Return or extraction motor

Rated current: Absorbed current:
Protection setting value:

Heating element (pre-heating or post-heating)

Rated current: Absorbed current:
Protection setting value: Superheat setting:

Chilled water coil

Supply balancing valves setting: Bypass balancing valve setting:

Freezing danger thermostat setting:

Pressure switches

Pre-filter pressure switch setting: Filter pressure switch setting:

Supply motor control pressure switch setting:
Return or extraction motor pressure switch setting:

Air flow rates

Fresh air flow rate measurement: Supply air flow rate measurement:

Return or extracted air flow rate measurement:

Air flow rate measurements must also be taken for all spaces to be ventilated or air-conditioned. All these measurements must be included on the commissioning card.

9. SYSTEM BLOCK DIAGRAM

The block diagram of the ventilation and air-conditioning systems will be supplied to the companies by UNOG technical services. The block diagram showing the air flow rates, water flow rates, temperatures, pressures, capacities, % opening of shutters, etc., must be updated by the company after commissioning of the system and must be included in the system technical documents, based on the template below.