CERN OPENDAYS

ENERGY EFFICENCY ENERGY SAVING





Explore the future with us **Explorez le futur avec nous**

A free cooling system dedicated to high precision machining equipment

HVAC renovation in building 156

C. Martel, Y. Obry, D. Potard, CERN

Building 156 was built in 1972, in order to house a helium experimental hall.

Hall 156 is became an extension of the mechanical activities of the Main Workshop located in building 100.

With 900 m2 of useful surface, a height of 9 m and two travelling cranes (20 tonnes capacity each), the hall is now housing

high precision CNC machines, working areas and a welding workshop.

The building was renovated reusing the previous architectural concepts: the two technical were reused and renovated, and the

Principle of the ventilation system

four existing vertical concrete shafts were reused for ducting the air supply, serving a new air diffusion concept. The air displacement principle was chosen in order to provide stability of the temperature in the air volume of the machines.

Before renovation works

After renovation works



Motorised air displacement diffusers







Hall 156

Energy saving

system to air distribution systems.

recovery battery before exhaust.

extraction.

Basic data

(156/R-401) Hall

- Two air handling units, 35 000 m³/h each.
- DN1200 ventilation air ducts.
- 16 motorised air displacement terminals, 4400 m³/h each.
- 100% free cooling mode possible when outdoor temperature is below to 20°C.



The mixing system

A mixing system causes the temperature and contaminant levels to be the same throughout the entire room. This is the traditional of supplying fresh air. Cool air is blown in near the ceiling at a relatively high velocity, diluting the air borne contaminants and altering the temperature of the premises.





The displacement system

In a displacement system, the occupied zone remains temperate while the ceiling zone heats up. During the summer, the ceiling zone become quite warm, while during the winter, it is only a few degrees warmer than the floor zone.

Contaminants also collect at the ceiling zone, no matter the season.





The B156 building 3D REVIT[®] model





The hall of the building 156, is heated and cooled by two double stream ventilation systems. There will be an overpressure in the hall compared to outdoor.

To comply with machines requirements (precision machine tools), the indoor temperature during heating or cooling mode will be constant in the hall. The air diffusion mode will provide air supply at the floor level of the building, with low speed flow and at temperature very similar to the ambiance, via each diffuser. Then, the supply air

will move slowly and horizontally up to the machines, and then will start a vertical ascent, when its temperature will increase due to heat loads of the machines.

Throughout the hall, a vertical stratification of the temperature shall be controlled and limited to 2°C difference, between 1.5 and 4 m high.

The CERN central heating network will provide heating to the building. The high-pressure overheated water supply (90/70°C) will feed the primary circuit of a hydraulic skid. The secondary circuit (low-pressure) of the skid will finally supply the heating batteries of the air handling units (60/40°C).

The cooling production will be done by two chillers sized to supply chilled water at 10/15°C at nominal power 400 kW. It will be used when the free cooling mode will be not operational due to extreme outdoor temperature conditions.





