

# MST ENSCHEDE – AN EXTRA CLASS HOSPITAL. WITH TOP CLASS VENTILATION AND AIR CONDITIONING.

[□ back to the overview](#)

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The Medisch Spectrum Twente (MST) in Enschede, a Dutch city near the Dutch-German border, was opened on 11 June 2016 right in the centre of the city. With an area of more than 78,000 square metres, roughly the size of ten football fields, the new hospital offers 620 beds. If you are standing in front of the impressive building, nothing reminds you of the austere atmosphere that is so typical of most hospitals. Glazed façades stress the building's accessibility and welcoming atmosphere. The five interconnected hospital blocks are reminiscent of a hand, and the spacious atria ensure that the patient rooms receive plenty of natural light. The pleasant colour scheme is supposed to make patients feel comfortable. Walls in wasabi green are said to have a positive influence on the patients' mood, and effective noise insulation additionally supports the healing process. During the warm summer months, component activation helps to keep the rooms cool.

The healing effect of healthy air.

A hospital of this size needs of course the best possible room air conditioning system, which ensures a constant supply of sufficient and hygienically safe air. This is essential, and not only for the patients' recovery; studies have shown that it also increases the efficiency of the staff. The system was to meet the following requirements:

- Ensure the necessary air change and maintain stringent room air conditions (differential pressure, temperature and humidity)
- Minimise the level of airborne bacterial contaminants, particularly in highly sensitive areas such as operating theatres and intensive care unit
- Air handling units that meet high hygiene requirements
- Configurable air handling units that are highly flexible with regard to volume flow rates and dimensions
- Air handling units with a sound power level of less than 50 dB(A)
- Limit the concentration of contaminants in the occupied zone

Safe hygiene practice in aseptic areas.

As one would expect, the most critical requirements apply to the operating theatres on the 3rd floor. To prevent infections caused by airborne pathogens, and to ensure that standards of occupational medicine are adhered to, airflow (low turbulence laminar flow) and air filtration (HEPA filters) play a vital role.

15 air handling units have been installed on the floor above the operating theatres and IC units and provide hygienic, clean air. F9 NanoWave filters filter the fresh air in two stages. High-efficiency filters are used as the final filter stage in the operating theatre ceilings and in air terminal devices to avoid any contamination of the room air with micro-organisms as much as possible.

The air handling units had to meet the toughest hygiene requirements (VDI 6022). A smooth exterior, powder-coated surfaces on the inside, stainless steel floors, and a stainless steel condensate drip tray, which is sloped in all directions, meet the most stringent hygiene requirements. So does the integral cable duct. 'The functional modules are really easy to access for inspection, which is due every six months, and filter change and cleaning are a breeze,' says Hub Westendorp, the technician in charge of the hospital.

Ventilation and air conditioning in the operating theatres require redundant systems. This is why the air handling units were designed accordingly: If one unit fails, the other one will take over and hence ensure a sufficient supply air flow rate at all times.

In highly sensitive areas the air must flow into only one direction, i.e. from more sterile rooms (e.g. operating theatres) to less sterile rooms. As long as positive pressure prevails, no pathogens can enter from adjoining areas. This is ensured by an intelligent control system which controls different supply air and extract air flows and maintains the required pressure in the entire operating theatre area; rooms that need to be more sterile are hence kept separate from those which may be less sterile.

Care units and staff areas.

The 6th floor is home to 50 air handling units of different sizes which provide ventilation and air conditioning to the various wards, staff areas, offices and kitchens. The floor with the technical equipment is open on the sides that face an atrium. This is why the sound power level of the air handling units has to be low. As a consequence, it is remarkably quiet on the 6th floor. Not a sound enters the patient rooms, thanks to efficient splitter sound attenuators, which effectively reduce sound power levels.

The unusual architecture results in very different room air conditions and requires a high degree of flexibility from the air handling units. The modular structure of the air handling units and the fact that they can be configured individually allows for adapting them to the available space and to bespoke ventilation requirements. So you find long and small, short and compact, and large and wide units on the technical floor, and they may be standing side by side or stacked, fit for the installation location. This flexibility was – in addition to the hygiene requirements and the low noise levels – one of the decisive criteria for the specification of the units.

Health care across the border.

Enschede cares for more and more patients also from Germany. This includes patients who are injured in an accident and then taken to the hospital in an ambulance or rescue helicopter. The MST is the only Dutch institution that has been approved by the German Association for Trauma Surgery. The MST also has a cooperation agreement with St. Antonius Hospital in neighbouring Gronau, Germany, to also admit children from across the border to the childrens' ward of the Dutch MST.

Architecture:

620 beds

42 intensive care rooms

15 operating theatres, including 11 for general surgery and 4 for heart surgery

Construction cost: €260 million

Interior equipment: €100 million

Architect: IAA Architecten

Building services: Deerns Raadgevende Ingenieurs

HVAC contractors: Installatie Combinatie IC-CUW

Air Distribution Technology:

80 air handling units, including 15 for operating theatres and ICU

Fresh air flow rate: 1,300,000 m<sup>3</sup>/h

Volume flow rate, smoke extract: 2,000,000 m<sup>3</sup>/h

The spacious glass architecture with light-flooded atria creates a bright and friendly atmosphere.

A seemingly endless row of hygiene-specific air handling units on the technical floor.

Intelligent controls ensure that the correct volume flow rates and pressures are maintained in highly sensitive areas.