

# Constructing a "Sustainable Structure" at Expo 2020 Dubai

The lead architect of the Netherlands Pavilion and associate architect at V8 Architects, David Spierings, talks to MEP Middle East editor, Anup Oommen, about the "harvest machine" built with reusable, recyclable, and bio-based material, while showcasing the intrinsic interactions between water, energy, and food in a sustainable environment

Photos courtesy: Faisal Qhatib Photography / Netherlands Pavilion at Expo 2020 Dubai



he Netherlands Pavilion, which is located within the Sustainability District of the 4.38km2 Expo 2020 Dubai site, has crossed the 95% milestone on the installation of MEP works, and has begun to receive power in its low-voltage rooms.

The Ministry of Foreign Affairs of the Netherlands and the Netherlands Enterprise Agency – which is a government agency operating under the auspices of the Ministry of Economic Affairs and Climate Policy of the Netherlands – awarded the design, construction, and dismantling works of the pavilion to a consortium following an official tender competition.

The consortium comprises the main contractor Expomobilia MCH Global; the main architect for the pavilion, Netherlandsheadquartered V8 Architects; the experience architect Kossmann.dejong, which is responsible for the interactive visitor experiences; and Dutch engineering and consultancy firm Witteveen+Bos, which is the pavilion's structural and MEP advisor.

The local MEP advisor and MEP subcontractor on the project is OXYPRO





Electromechanical Contractors, which is an ISO certified, DEWA- and Dubai Municipalityapproved electromechanical contractor with more than 20 years of expertise in the region.

Sharing key construction updates in an exclusive interview with MEP Middle East, the lead architect of the Netherlands Pavilion and associate architect at V8 Architects, David Spierings, confirms: "We have started the testing and commissioning of MEP works within the Netherlands Pavilion. Currently, more than 173,580 safe man-hours without lost-time injury have been completed on the project."

Based on the theme "Uniting Water, Energy, and Food", the Netherlands Pavilion will bring sustainable solutions to life by "creating a climate system inside its pavilion".

The pavilion, which covers a total built-up area of approximately 3,700m2, will comprise of an expansive hall, within which a large vertical cone is being constructed. The vertical cone will be covered with edible plants on the outside, while oyster mushrooms will be grown on the inside of the cone. "We see our pavilion as a harvesting machine or biotope. The main theme of the Netherlands Pavilion will literally showcase how the elements of water, energy, and food, are intrinsically linked to each other," Spierings explains. "Expo 2020 Dubai visitors who enter our pavilion will have the opportunity to enjoy a complete sensory experience, stimulating and triggering all their senses – they will have the opportunity to see, hear, smell, feel, and taste the beauty of the Netherlands."

The edible plants and the mushrooms in the vertical cone will be irrigated through water harvested from Dubai's desert air using a water production machine that incorporates SunGlacier technology.

"This machine will produce water from air with a subtraction level up to 99%. The machine will also produce cold air to keep the inside of the cone cool, in order to grow mushrooms.

"The water will also be used to irrigate plants, and to feed into the adiabatic cooling systems. Additionally, the water will be used for a surprise that we have prepared for our Visitors Show inside the cone, which you should come and see for yourself while visiting the Netherlands Pavilion," Spierings teases.

Holland Water will offer water purification services to the Netherlands Pavilion at Expo 2020 to prevent legionella and other infections in water. Holland Water ensures water purity through the ionisation of water, avoiding the use of chlorides as is traditionally used to purify water.

Netherlands-based MJ Tech supplied the adiabatic cooling systems, which provide the right humidity and cooling for the biotope.

The irrigation systems for the plants on the vertical farming have been supplied by Netherlands-based greenhouse builder BOM Group.

In addition to harvesting water from the air, the pavilion will also harvest energy from the sun through organic photovoltaic (OPV) elements in the roof's skylights.

Spierings explains: "The pavilion will have six rows of 22m-long skylights with OPV cells on top. These transparent skylights

permit a spectrum of beautiful coloured light to seep through, which is ideal for plants to grow, while at the same time generating energy. The technology does not include toxic elements, and is an environmentally friendly technology."

Solar designer Marjan van Aubel Studio supplied the OPV skylights, which were installed by Al Hasoun Dubai – a UAE-based construction firm that has also supplied traditional PV systems for the pavilion.

The lighting for the Netherlands Pavilion has been supplied by Eindhovenheadquartered multinational firm Signify, with Triangle providing distribution and installation services in Dubai.

Sharing details about the construction progress on site, Spierings says: "Right now we are testing all the MEP equipment in and around the cone to prepare the climate for our plants and mushrooms to grow.

"The installation of the OPV panels on the roof is ongoing and the water production unit will be installed in the coming period. After these are all linked and tuned, the plants will arrive in the pavilion and the first mushrooms will start to grow."

The pavilion will also showcase a global first-of-its-kind curtain made out of bio-based polymers, with design and textiles supplied by Amsterdam-based Buro Belén.

In addition, the pavilion will have tiles made with mycelium – the vegetative part of a fungus, which once dried, will make up the basis of the tiles. The bio-based mycelium tiles and acoustic elements in the Netherlands pavilion will be supplied by Italian firm Mogu.

Commenting on the main challenges overcome during the construction of the project, Spierings says: "Since we had partners from Dubai and the Netherlands, it was not easy to connect all the systems together to create the right climate for our biotope inside and outside of the cone.

"The goal was reached by having extensive meetings and workshops with all parties involved.

"All systems were eventually aligned to work as a single machine, and to provide the right conditions for our plants and mushrooms to grow, while having a comfortable space for visitors, guests, and employees."

The Netherlands Pavilion also attempted to minimise its carbon footprint as much as possible.

"We like to think of our pavilion as a showcase of circularity, and this starts right from the construction materials used on the project. Normally, the construction material of an average building with a lifespan of 60 years accounts for up to 60% of the total carbon footprint. For a six-month event, the utilisation of traditional construction material





could have had a much larger impact on the total carbon footprint of the building," Spierings explains.

As a result, the Netherlands Pavilion was constructed as a temporary structure that will be dismantled after Expo 2020 Dubai wraps up on 31 March 2022.

Spierings adds: "We 'harvested' as much material as possible locally. We found a Dutch company working locally with sheet piles and big tubes, which is normally used for infrastructural, civic, or underground structures. We leased the sheet piles and tubes from them to create our structure and all of it will be fully re-used in other local projects after the pavilion is dismantled." The Netherlands Pavilion was also highly focussed on having a sustainable temporary building. All the building material suppliers were told to incorporate a circular approach.

Spierings says: "As this is not a usual practice in the building industry, it took quite a bit of effort. However, after explaining the principles of our concept to all the stakeholders involved, they went the extra mile to comply with our circular approach."

As a result, every single material used in the construction of the Netherlands Pavilion at Expo 2020 Dubai is either reusable, fully recyclable, or is cutting-edge bio-based and bio-degradable, making the pavilion a truly sustainable structure within the Sustainability District of Expo 2020 Dubai.