



#### FACTS

- The Maas Tunnel was built in 1942. It is the oldest immersed tube tunnel in the Netherlands.
- The tunnel has four tubes: two for cars, one for bicycles and one for pedestrians. When the car tunnels are ready in 2019, work will start on the other construction elements and the bicycle and pedestrian tunnels.
- The tunnel will be renovated one tube at a time. One tube will always be kept open to traffic, allowing vehicles to travel from south to north and so access the Erasmus Medical Centre.
- Visitors to Concrete Day 2017 could take a virtual look tour around the Maas Tunnel using a VR headset.
- 22 million cars drive through the 1,373 metre tunnel every year.

By 2019, the Maas Tunnel must have regained the look and feel of a 1940s' tunnel and it must comply with the new Tunnel Safety Act when it is handed over. "Two requirements that are at odds with each other," says project manager Jacco Groen. "That's what makes this huge project so demanding and complex. But by applying our combined know-how and expertise, we are creating a unique project."

## Maas Tunnel

### Renovating with respect for history

"We" are the three TBI companies that are carrying out the work as members of Combinatie Aanpak Maastunnel (CAM). Project leader Jacco Groen thinks it is "fairly unique" to have so many TBI companies working together on the same project. He calls it "Building with our brothers": "Mobilis is responsible for all the civil engineering, Nico de Bont for the restoration work and Croonwouter&dros for the technical tunnel systems and for the operating and signalling equipment in the traffic control centre. Servicis is also taking part. It's responsible for repairing the decayed concrete."

The poor condition of the concrete was the immediate cause of the need to renovate the tunnel. A study in 2011 found that the carriageway and the concrete road bed had deteriorated very badly, probably because damp and gritting salt had worked their way through the cracks in the carriageway. "Once the road bed has been repaired," says Groen, "we'll lay a new layer of yellow asphalt. When the tunnel was first built in 1942, it was surfaced with yellow clinker bricks. We can't use clinkers nowadays, of course, they make far too much noise, but the yellow sand colour will give the tunnel the same historical appearance."

#### Tiles from Barcelona

To return the tunnel to its original state in so far as possible, the characteristic yellow lighting will also be refitted. "That was a real challenge," recalls Groen. "We wanted to fit environmentally friendly LED lamps but the light they emit is usually a clear blue."

The right LED lamps were not so easy to find. "We tested several lamps by hanging them between the old sodium lights. We didn't take a decision on which lamps to fit until the difference between the new lamps and the old ones was so small that you couldn't see it. The lamps will also be housed in fittings cast in the original way."

The new tiles also had to have exactly the same colour and appearance as the original ones. After a long search, Nico de Bont eventually found a factory in Barcelona that could make them by hand. "In total we needed about 600,000 new tiles," recalls Groen. "Old tiles that had worked loose or had been damaged had to be chipped off in the tunnel one at a time."

#### Safe escape route

The demands made on the renovation and restoration were high, but the safety requirements were even stricter. "And the two clashed now and then," says Groen. "But we couldn't let one be at the expense of the other." Sometimes the solution was straightforward: in an emergency, for example, the yellow lights can be changed to white at the flick of a switch in order to increase visibility for the emergency services.

The construction consortium faced an even bigger problem renovating the escape routes. "In an emergency," Groen explains, "you couldn't go from one tunnel tube to another as you usually can. You had to climb up a kind of swimming pool ladder, straight up. You can imagine the problems you would have if you weren't so quick on your feet. New, wider steps have now been installed that automatically extend in the event of an emergency. We're leaving the old ladders in place because of their historic value."

A new ventilation system will also be fitted that will be activated in the event of an accident. The system will blow smoke sideways so that cars behind the accident do not drive into it. The other tunnel tubes will also be ventilated to prevent smoke getting into them via the escape doors.

That is not the only innovation Groen is proud of: the tunnel will also have an Adaptive Traffic Control System (ATCS). "A system like that has never been used in a tunnel before. Radar detectors and detection loops will record the number of cars and calculate how fast they are moving through the tunnel." The information will be fed into a central computer system that decides whether measures have to be taken. "If there has been an accident, the system will change the lights to green so that the traffic can leave the tunnel as quickly as possible."