



## CUSTOMER CASE STUDY

# Citect SCADA at the heart of Europe's first double-decker tunnel

Avenue2 (A2) Maastricht - [www.a2maastricht.nl](http://www.a2maastricht.nl)  
Industry - Infrastructure

## Goals

- A2 sought a solution partner that could manage the complete automation and energy distribution systems for Europe's first dual-levelled tunnel
- A comprehensive tunnel monitoring and control system to manage the diverse network of operation and safety subsystems, responsible for the safe transit of more than 45,000 vehicles daily
- The solution not only had to successfully manage the complex automation demands of the project, but also play a key role in the city's integrated sustainability plan

## Challenges

- Robust system required to comply with stringent new National Tunnel Standard for operational efficiency and safety management
- High availability real-time redundancy requirements crucial with tunnel closure resulting in significant fines

- Ergonomic HMI to adhere to specific requirements, with the total cycle time to screen call-up not to exceed 1 second
- Out of the box SCADA functionality with flexibility to deliver additional library objects and complex escalation workflows for emergency services system integration
- Tight timelines and budget due to the national and local recognition of such an economically significant project

## AVEVA Solution

- Citect SCADA and CitectHistorian
- Modicon Quantum PLC
- Modicon STB I/O
- UAG and EcoStruxure Control Expert (Unity Pro)
- Ethernet IP and Modbus/TCP
- EcoStruxure Power

## Results

- Schneider Electric selected as the end-to-end solution partner, managing the complete automation and energy distribution systems for the tunnel
- Tunnel control system successfully satisfies the more than 10,000 requirements of the National Tunnel Standard
- Project successfully delivered on time and on budget, with 80% of the peak-hour traffic congestion successfully diverted

### An Infrastructure First for Europe

The A2 Motorway near the Dutch city of Maastricht has long been an important route for through traffic to and from Belgium, Germany and France; and as the gateway to Southern Europe has been a source of major traffic congestion for some time. Add local traffic to the mix and that translates to around 45,000 vehicles using the Motorway every day.

However since the opening of the (Koning Willem-Alexander) tunnel in December 2016, approximately 80% of the peak-hour congestion has been diverted, with the cross-city bypass now taking 5 minutes instead of more than 30.

Taking 5 years to build the 2.3 km tunnel is the first of its kind in Europe, with four tunnel tubes stacked on top of each other, effectively separating local from transit traffic. The realization of the project was also part of an

integrated sustainability plan for the city, allowing the community to claim back the 'parklaan' or green space on top of the tunnel. Replacing the original highway with 2000 trees not only offered an idyllic green avenue for pedestrians and cyclists, as well as property and economic opportunities for the community; but more importantly reconnected a city that was previously divided.

### Stringent New Tunnel Standards

The A2 tunnel project was carried out by the Avenue2 Consortium, consisting of construction engineering company Ballast Nedam and contractor Strukton, following a comprehensive planning period. Collectively there was a regular staff of more than 50, with over 500 contractors working on the project day to day.

The unique and complex design of the tunnel resulted in the Dutch Ministry of Infrastructure and the Environment introducing a new National Tunnel Standard (the Landelijke Tunnel Standard "LTS") to ensure the highest standards of safety and security were adhered to. As a result, more than 50 different traffic and tunnel management technical installations were implemented in accordance with the new "LTS" standard. Each ensuring smooth traffic flow, preventing and detecting incidents, as well as ensuring measures were in place for timely responses to emergencies. However operating these 50+ subsystems including energy supply, lighting, ventilation, emergency stations, CCTV surveillance, fire alarm systems and more – presented a number of complexities.



Knooppunt Europaplein

## An Integrated Tunnel Control System

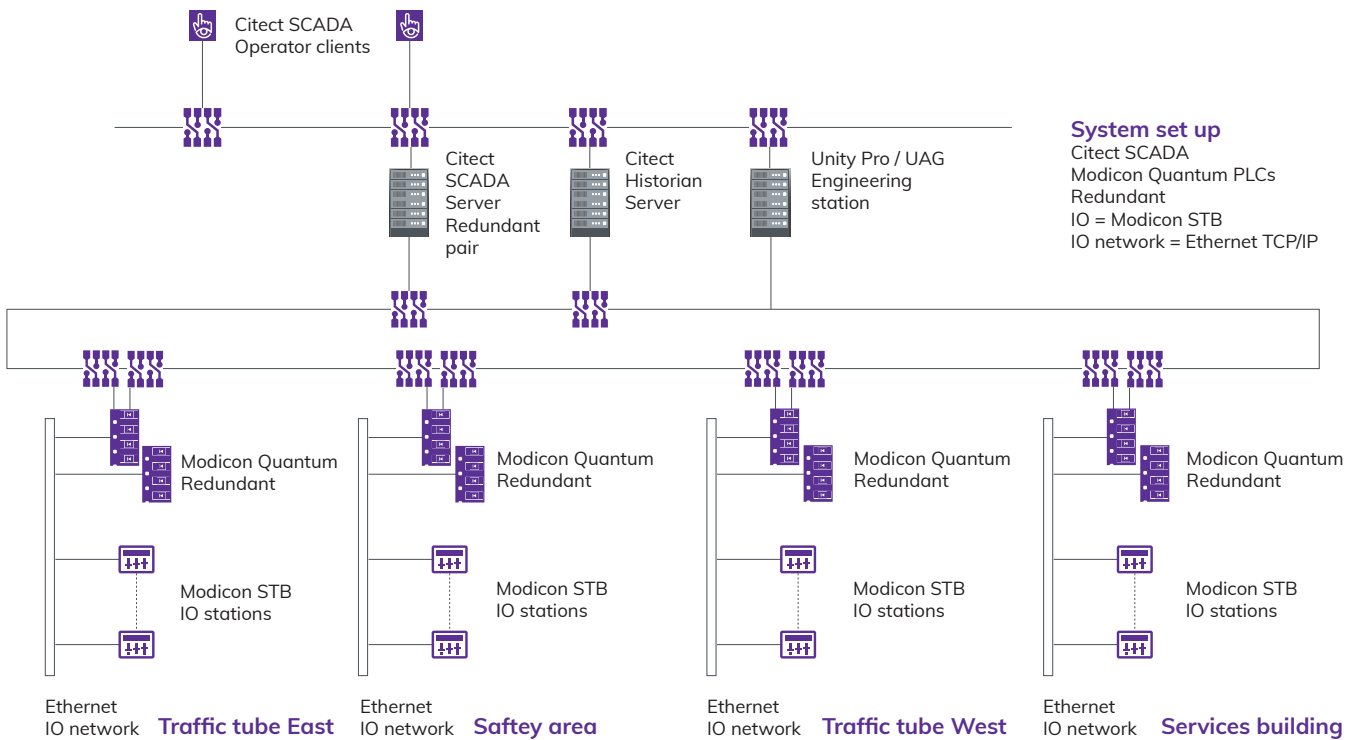
AVEVA was selected as the end-to-end solution partner to manage the efficient monitoring and control of the various tunnel and traffic-related subsystems throughout the system. With the responsibility for the entire tunnel automation and energy distribution systems, Citect SCADA was at the core of the control system with redundant Citect SCADA servers integrated with hot standby Quantum PLCs. With the complexities of the “LTS” tunnel standard and requirements to consistently translate the standards into the PLC control system, a comprehensive software guideline was written with a dedicated library built for the equipment layer. The equipment layer was then generated from the central design database with the functional specification translated directly into the software.

“During the design and realization phases, we worked closely together to coordinate these automated systems with each other. We are very proud that we have finalised this project on time and with success.”

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**Hans van Engelen,**  
 Project Manager, Traffic & Tunnel Technical Installations (VTTI)  
 Software, Avenue2

## Tunnel System Setup

(Tunnel Technical Installation)



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The system architecture comprised:

- Citect SCADA redundant servers
- CitectHistorian
- Modicon Quantum PLCs (7 redundant PLCs with hot standby and 3 single PLCs)
- Modicon STB I/O (300 STBNIC2212 | 10,000 I/O)
- Unity Application Generator (UAG) and EcoStruxure Control Expert (formerly Unity Pro)
- M580 PLCs and Magelis HMI
- Ethernet IP and Modbus TCP
- MV transformers and switchgear
- LV iPCC, LV distribution and Altivar drives
- UPS
- Sensors (>1000)

## Central Command Rooms – The Brains of the Tunnel

The A2 tunnel has 2 main command rooms, one in a service building in the south and one to the north. Both are known as the ‘brains of the tunnel’ given their role in managing the data convergence for the entire tunnel system and the monitoring and controlling of more than 50 tunnel and traffic-related systems.

The tunnel’s Citect-based SCADA control system ensures that the vast volume of information that is being monitored, is seamlessly displayed to operators in a user-friendly graphical interface on workstations in both control rooms. Operators can view the system status in real-time, taking swift corrective action as needed on any of the tunnel and traffic-related technical subsystems being remotely controlled.

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“We’ve installed the Avantis.DSS solution and it paid for itself almost immediately. It turns raw data into business intelligence and that improves our performance.”

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**Maike Nieuwenhuis,**  
Business Development Manager, AVEVA

The combination of Citect SCADA and Quantum PLCs were selected due to their high level availability and reliability, with the PLCs configured using Schneider Electric’s EcoStruxure Control Expert software (formerly Unity Pro). With system failures out of the question in such a critical application, the solution’s robustness and adherence to the stringent standards was instrumental in it’s success in being selected for the project.

## Collaboration – Key to Project’s Success

The close collaboration and transparency between all parties involved in the A2 project, was also vital to it’s success. From the outset and throughout the comprehensive planning period all parties were aligned on the objectives and committed to the delivery of the tunnel within the set timeframe and allocated budget.

Schneider Electric’s willingness to go beyond being just a solution partner to actively collaborating within the project team, ensured the project was delivered successfully and on time.