Complete tunnel technology from a single source

Maximum safety and security for both, road users and operators
Why is Siemens the ideal partner for tunnel equipment?

There are many reasons, but the most important one are the following:

Siemens ensures seamless interaction between all and any subsystems and technologies.

On page 4 you can read more about our “seamless tunnel technology”.

The Siemens tunnel control center gives you control over the entire tunnel operation and all safety systems. In one project, as many as 29 tunnels have been connected to a single center.

Starting on page 6 we tell you more about the very heart of tunnel technology.

Siemens has a wealth of ‘tunnel experience’ – 530 kilometers, to be exact.

Page 8 lists the best examples.

Siemens is a real ‘value-added’ partner offering much more than technical solutions.

Go to page 10 to learn everything about this added value.

Looking for a one-stop solution partnership for all technical systems in and around the tunnel? Project implementation on time and within budget?

Welcome to Siemens!
Safety first!

Our technical tunnel equipment stands for safety in tunnel operation: The customers are on the safe side because they can rely on integrated all-round solutions from a single source, based on proven technologies, high quality standards and maximum availability. And the road users can feel safe because the tunnel equipment meets strict safety standards and includes state-of-the-art systems that ensure the smooth flow of traffic and rapid detection of any incident.
Mature and reliable solutions ranging from emergency phones and efficient ventilation systems right up to video cameras for hazardous-material detection.

Everything for a smooth and steady traffic flow
When monitored and controlled by our systems, traffic can flow evenly and smoothly through the tunnel. Depending on requirements, we implement complex solutions up to a fully automated traffic control system that is connected to the traffic computers for the up- and downstream roads and autonomously controls traffic signals and signs as well as information displays. Of course, operators in the control center can always intervene and manually define the state of the signaling systems and the content of the signage.

Everything managed perfectly: energy, air, lighting
A reliable and secure energy supply is absolutely vital for the entire system. We make sure that all safety-critical systems continue to work perfectly should voltage dips or interruptions and even extended power outages occur. Fresh air is supplied by our tunnel ventilation systems at all times. On the basis of a holistic safety concept, we decide if longitudinal, transverse or semi-transverse ventilation is the best solution for the case at hand. For all three ventilation types, Siemens offers a reliable and durable solution that will prevent the worst from happening in case of an incident.

We also have the right solutions to protect drivers against the feared “black hole” effect: In the tunnel entrance area, adaptive lighting systems ensure staggered brightness levels to match the brightness level outside, giving the drivers’ vision time to adjust – for a safer driving experience. Such a scheme can be realized with dimmable, energy-efficient and maintenance-friendly LED technology.

Artificial noses and eyes that will not miss anything
Our CO and NOx sensors and vision-impairment measuring units continually test the air in the tunnel. The measured values are then used for precise and targeted ventilation control. If the set limits are exceeded, the system can automatically block off traffic access to the tunnel. Our automatic fire alarm systems, too, monitor all areas of the tunnel. They are able to determine the precise location where a fire has broken out, and use advanced smoke gas detection technology to spot even small fires early on. All this means that, in an emergency, the appropriate measures can be taken faster and in a more targeted manner.

And then there are our robust high-resolution cameras, which keep watch over every meter of the tunnel and transmit their images in real time to the monitoring screens in the tunnel control center. The cameras can be fitted with swivel drives or special lenses and, besides smoke detection, offer traffic counting and incident detection functions.

Always well connected to the “outside”
Facilities provided on the outside must also be available inside the tunnel: Road users want to listen to the radio or may need to use their mobile phones, as do maintenance crews. And rescue services need reliable radio contact. Our HF tunnel radio systems ensure consistently good reception throughout the entire tunnel. If necessary, the tunnel control center can broadcast important announcements via the car radios. Communication in the tunnel must also be guaranteed at all times: People can use the emergency phones to establish a telephone link to the personnel in the control center. The state-of-the-art loudspeakers and sophisticated control algorithms of the public address system ensure that all messages can be clearly understood despite the difficult acoustics in a tunnel. Technical staff can communicate with each other via the intercom system.

Perfect overview of all hazardous goods present
In an emergency it can be literally of vital importance to know which hazardous substances are currently being transported in the tunnel, and how these must be handled in case of fire or another emergency. Our video-based system for hazardous-cargo detection provides the required information so that the operator can advise the rescue services accordingly. Moreover, the system allows to automatically check adherence to the ADR classification of the tunnel.
Tunnel technology from a single source and a single mold

The Siemens portfolio covers the whole range of technical systems that are needed in tunnels, from traffic management right up to power supply and emergency call systems. The responsible public authorities stand to benefit in multiple ways: The different components are perfectly coordinated and designed for seamless interaction from the start. If required, Siemens will act as system integrator and combine components provided by different parties into a reliable integrated system.
All technical tunnel systems under perfect control

The Siemens tunnel control center does more than manage the available traffic guidance and control equipment. The entire tunnel operating equipment is connected to the control center and can be fully monitored and controlled from there, including power supply and emergency phones. This is a substantial contribution to safe tunnel operation because hazardous situations can be detected and resolved faster. Another key advantage: The uniform look & feel and highly ergonomic design of the user interface!
The data provided by all systems – from traffic management right through to ventilation – converge in the tunnel control center.

**The Siemens tunnel control center – the heart of the entire tunnel equipment**

The tunnel control center is where all data converge so that all technical systems in a tunnel can be controlled and monitored from a central location:

- Lighting
- Fire detection
- Power supply
- Fire extinction
- Hazardous-cargo detection
- Ventilation
- Emergency call system
- Traffic management system
- Traffic counting
- Video surveillance

The make and model of those systems doesn’t matter. The new tunnel control center includes open interfaces according to international standards – for efficient data exchange with subsystems from a wide range of providers.

**Ergonomic design for maximum safety**

The Siemens tunnel control center can be customized to meet the specific requirements of the project. With a push of the button, for instance, the operator can select the language for all screens and switch online between English, German, French and Chinese. For countries where other languages are spoken, we can implement additional language versions as needed. Just like in all cases where people have to deal with highly complex technology, being able to operate the system via a user interface in one’s mother tongue makes operation much easier and much safer.

**Uniform display of status information for all connected systems**

The tunnel control center uses exactly the same display format and rules for alerts of various priorities as well as all other information. This means that, for instance, alerts are always displayed at the top of the screen, and the same color scheme is used to mark the different priority levels of all types of messages. Especially in large tunnel centers where multiple monitoring screens are used, this standardization is of valuable assistance to the operators and helps them recognize dangerous situations faster and more clearly.
**Espiy-Sarp Tunnels/Turkey:**

**29 tunnels, 33 kilometers, 1 control center**

The most extensive tunnel project that Siemens has carried out to date was the turnkey completion of all electrical and electromechanical work and implementation of the system concept for 29 tunnels on a 359-km road section – absolutely within schedule and budget. Siemens’ scope of performance included power supply, lighting, ventilation, fire detection, CCTV systems, tunnel radio system, emergency call system, traffic detection, tunnel control center and system integration. This single-source concept offered the customer a special benefit: The technical systems of all 29 tunnels can be controlled and monitored from a single control center.

**Cross-Harbour Tunnel/Hong Kong:**

**Old tunnel upgraded with new technology**

The tunnel was built in 1972 and originally designed for a daily throughput of 80,000 vehicles. Today, 122,000 cars pass through it on a typical workday – but backlogs are rare. During ongoing (!) operation, Siemens has equipped the tunnel with a complete range of modern technical systems, including state-of-the-art signage, access metering, automatic accident detection, control center, communication system, power supply and environmental data monitoring.

**Stadsbaantunnel Utrecht/The Netherlands:**

**Only 24 months between agreement and tunnel opening**

Utrecht is building the largest new urban development in the Netherlands: It is designed for 80,000 inhabitants and 40,000 jobs and equipped with cutting-edge infrastructure systems. The main access road is an 800-m urban tunnel that crosses underneath the rail tracks and links the new quarter directly to the A2 motorway. Siemens acted as general contractor for the construction and maintenance of the technical tunnel systems, including traffic management systems and control center. What made this project special is that halfway through the tunnel, there is an exit road serving as delivery access for a major shopping mall.

**Richard-Strauss-Tunnel in Munich/Germany:**

**Advanced traffic control technology reduces congestion**

This 1,500-m tunnel with its seven exits has made a major contribution to channeling through-traffic on Munich’s middle ring road more efficiently and thus reduce congestion and environmental load. Every day, 96,000 vehicles pass through the tunnel for which Siemens has implemented a cutting-edge traffic control system based on comprehensive video-based traffic detection functions.

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### Tunnel experience around the globe

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530 kilometers of tunnel experience. Around the globe.

One of Siemens’ first tunnel projects was the 15-km long tunnel through the Arlberg Mountain in Tyrol/Austria. This was in 1978, almost 40 years ago. Since then, we have equipped so many tunnels all over the world that their combined length exceeds 530 kilometers. The scope of performance has been as varied as the projects: In some cases we acted as general contractor, in others we delivered individual systems.
An added-value partner: Siemens.

For all tunnel projects, Siemens is collaborating closely with the customer – from the very start. Planning, engineering, installation and commissioning are closely coordinated with our clients. We can also provide training to the operating personnel, take over maintenance tasks or provide financing – just as the customer and the project require. An all-inclusive solution partnership that offers numerous advantages.
Innovation powerhouse for new technologies
The products and systems provided by Siemens always meet the highest requirements and are often pacesetters for new solutions that are even safer and more cost-efficient. This is not surprising in the light of the fact that, every year, we spend more than €4.5 billion on research and development and apply for 3,700 patents. Of the global total of 348,000 Siemens employees, 30,000 are dedicating their entire workday to the development of new, innovative solutions. Hence our customers can be sure to always get the latest technology.

Never far away in whatever part of the world
Wherever there is a tunnel project to be realized, we are right at hand. Siemens has local offices and service centers in 192 countries around the globe. We know about local conditions and customs and are able to complete even complex projects on time and within budget. And thanks to our permanent local presence, the customer can count on our professional support from initial planning right along the complete lifecycle of the facility.

Compliance with strict standards
All our hard- and software components are designed to proven international standards. Our technical systems can be flexibly adapted to special requests and are generally equipped for interoperability with third-party components. It goes without saying that they also meet the strictest quality and safety requirements. Hence all our solutions are always "value-added": safe, custom-tailored and cost-efficient.

Attractive solutions – also for financing and refinancing
If needed, we help our customers find viable financing solutions for their tunnel project. Besides conventional financing models, there are also new options, for instance solutions for refinancing via a satellite-based toll system. This is another of our business activities that we have been driving successfully all over the world.

An all-inclusive solution partnership for all technical systems in and around the tunnel?
Welcome to Siemens!
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