Your Success is Our Goal

Industrial Solutions and Services

Siemens AG

Intelligent Traffic Systems
I&S ITS

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Tunnel systems from Siemens

Safe in
Safe through
Safe out

Your Success is Our Goal
Everything from a single source. An overview of our portfolio is shown on pages 4 and 5.

Innovations for greater safety. Two examples are given on pages 6 and 7.

Five hundred kilometers of tunnel experience. Around 27 of these references are referred to in the references on pages 8 and 9.

The strengths of a global player. And the portfolio in detail. On pages 10 to 13.

"Safety First" is our motto. Good news for tunnel operators and road users alike. All our technical equipment for tunnels is developed according to this motto and contributes considerably to the well being of everyone involved: the operators, because they are supplied with integrated all-round solutions from a single source, which have proven their worth in practice, and which are highly available and meet high quality standards. And road users, because they travel through tunnels which have been equipped according to high safety standards to ensure the smooth flow of traffic and the rapid detection of incidents.

Cooperation with Siemens: a comprehensive partnership for comprehensive solutions. In all tunnel projects, we work closely with our customers from the very beginning. Planning, configuration, installation and commissioning are project aspects which we deal with in close consultation with our customers. When necessary, however, we also integrate components from different manufacturers to create a safety functioning all-round system for the tunnel in question. We also train the operating personnel, maintain the equipment, participate in financing, and support operation—depending on the requirements of the customer and the project.

Safety for a different kind of road.

A road in a tunnel can hardly be compared to normal roads. The roadway is narrower, the height is restricted and there is a distinct lack of daylight. Moreover, the space for maneuvering to avoid other vehicles is usually limited. In spite of all this, the safety risk is currently only slightly higher than on normal roads—so long as modern technical systems monitor all the important parameters, regulate the traffic and ensure a smooth flow of traffic.

This is where Siemens comes in as the ideal partner of choice.
"Safety First" is our motto. Good news for tunnel operators and road users alike. All our technical equipment for tunnels is developed according to this motto and contributes considerably to the well-being of everyone involved: the customers, because they are supplied with integrated all-round solutions which come from a single source, which have proven their worth in practice, and which are highly available and meet high quality standards. And road users, because they travel through tunnels which have been equipped according to high safety standards to ensure the smooth flow of traffic and the rapid detection of incidents.

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A road in a tunnel can hardly be compared to normal roads. The roadway is narrower, the height is restricted and there is a distinct lack of daylight. Moreover, the space for maneuvering to avoid other vehicles is usually limited. In spite of all this, the safety risk in tunnels is hardly any higher than on normal roads—as long as modern technical systems monitor all the important parameters, regulate the traffic and ensure a smooth flow of vehicles. This is where Siemens comes in as the ideal partner of choice.
A single partner for all your tunnel equipment? Welcome to Siemens!

Everything under control for the provision of air, power and light. A reliable power supply is absolutely vital for the whole system. We manufacture all the technical equipment—from the high-voltage switchgear to the low-voltage distribution boards—and ensure that all the safety-related systems continue working properly should voltage dips or even long power cuts occur. Fresh air is supplied by our tunnel ventilation systems at all times. Only the length of the tunnel determines whether longitudinal, transverse or semi-transverse ventilation is used. Whatever the need, we have the right solution. We also have solution packages which provide protection against the feared “black hole” effect: adaptation systems which stagger the level of brightness in the entrance areas to match the brightness outside the tunnel so that the driver can see better and is able to drive more safely.

Artificial nose and eyes which miss nothing. Our CO and NOx sensors and vision-impairment measuring units continually test the air in the tunnel. The values they register are then used as the basis for precise and reliable ventilation control. If certain limits are exceeded, the systems can automatically block off traffic access to the tunnel. Our automatic fire alarm systems can even detect precisely where a fire has broken out. In an emergency, the appropriate measures can then be taken faster and more securely. Finally, our robust cameras, which can be fitted with several dozen mechanisms or special lenses, keep watch over the entrance areas to the tunnel. They transmit the images live to the control systems in the tunnel control center. Apart from smoke, they can detect traffic and incidents as well.

Always well connected to the “outside”. Facilities provided on the outside must also function inside the tunnel: mobile phone and radio reception for the road users and a radio link for the rescue services. Our HF tunnel radio systems ensure constantly good reception throughout the entire tunnel. If necessary, we can arrange for important announcements from the tunnel control center to be made over the car radio. Communication in the tunnel itself must also be guaranteed at all times: the emergency call stations can be used to establish a telephone link to the monitoring personnel; important information can be passed on via amplifiers and loudspeakers and the personnel can communicate with each other via the intercom system.

A single partner for all your tunnel equipment?

From power supply to emergency call phones: Whoever wants to can obtain all the equipment for their road tunnel from a single-source partner—Siemens. The advantages are considerable: an integrated and all-round solution, only one contact partner for the whole project, and a uniform “look and feel” of the user interfaces to help prevent operating mistakes by the personnel.

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Every effort is made to provide a smooth, safe journey for the passengers. Siemens offers a comprehensive range of solutions that include power supply, ventilation, lighting, fire detection and suppression, environmental control, security, CCTV, emergency call, radio, traffic control, and other systems. Our systems are designed to ensure that all the necessary components are connected and can operate seamlessly to provide a safe and comfortable environment for passengers.

In case of an emergency, such as a fire, our automatic fire alarm systems can quickly detect the problem and take appropriate action to ensure the safety of passengers. Our ventilation systems are designed to provide fresh air to the tunnel at all times, and can be adjusted according to the length of the tunnel to ensure proper ventilation.

Our lighting systems are designed to provide adequate illumination for passengers and to ensure that the tunnel is well lit at all times. Our ventilation systems are designed to ensure that the air is clean and fresh, and that the temperature is comfortable for passengers.

In addition, our CCTV systems are designed to ensure that the tunnel is well monitored, and that any incidents can be quickly detected and responded to. Our emergency call systems allow passengers to quickly contact emergency services in case of an incident, and our radio systems allow passengers to stay connected while traveling through the tunnel.

Siemens is committed to providing reliable and efficient solutions for all aspects of tunnel operation, ensuring that passengers can travel safely and comfortably through the tunnel.
The Gräbern tunnel in Austria was the second tunnel in the world to be equipped with a VoIP digital emergency call system from Siemens.

The new tunnel control center: modular, standardized and packed full of international experience.

Our new international tunnel control center is highly standardized but still adaptable to special customer wishes. The tunnel control center is the heart of the whole control system. It is based on the information fairly bound together and the experience of the operators. It is modular and is used in all the stations of the tunnel system. Until now, we have practically tailormade each control center to fit the "vital statistics" of each individual tunnel. This means that each of the 30 control centers which we have installed around the globe was planned and executed according to the requirements in each case.

With SITRAFFIC® ITCC, the new international tunnel control center, we are taking a new approach. It includes centrally developed and updated software modules for the core function of all tunnel systems, has a modular design, is based on proven industrial middleware and uses Windows or Linux as the operating system irrespective of the hardware platform. This means that, while the control center's degree of standardization is considerably higher than before, it nevertheless allows flexible adaptation to the special needs of each case. Every customer is thus able to benefit from the experience gained in all other projects in the SITRAFFIC® ITCC network. A good illustration of this is that not only the control center itself but also the configuration process has been standardized so that a solution based on the new concept can be developed in a considerably shorter time and therefore at lower cost.

VoIP: The first digital emergency call system in the world. How can the emergency call systems in a country be standardized in such a way that all the safety equipment such as emergency call stations, escape routes, door monitoring units, fire extinguishers, signal heads etc. form a standardized network in which speech and all the signals can be digitally transmitted to and from the safety equipment?

In Austria, the "Voice over Internet Protocol" (VoIP) is being used for road management for the first time in the world. It was Siemens who developed and manufactured the first digital emergency call station. Thanks to a specially developed interface, emergency call stations of different manufacturers can be connected to the central tunnel control centers and connected together. The road management authority is therefore able to enjoy a high degree of flexibility in the organization of its emergency control centers and the selection of components.

New ways for more safety and economic efficiency.

The general parameters for tunnel solutions are changing continuously. Tunnels are becoming larger, the number of trucks and private vehicles is increasing, more safety standards are being adopted in many countries worldwide. To be able to respond to all these changes, Siemens is reacting to these changes with innovative solutions to ensure completely new ways of ensuring safety and efficiency.


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The new tunnel control center: modular, standardized and packed full of international experience.

Our new international tunnel control center: highly standardized but still adaptable to special customer wishes.

The tunnel control center is the heart of the whole control system. It is here that all the information flows from together and the operator obtains an overview of what is happening where. Up to now, we have practically tailor-made such control centers to fit the "vital statistics" of each individual tunnel. This means that each of the 30 control centers which we have installed around the globe was planned and executed according to the specific requirements of each case.

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In Austria, the "Voice over Internet Protocol" (VoIP) is being used for road management for the first time in the world. It was Siemens who developed and manufactured the IP-based emergency call stations. Thanks to a specially developed interface, emergency call stations of different manufacturers can now be connected to an emergency call center and networked together. The road management authority is therefore able to enjoy a high degree of flexibility in the organization of its emergency control centers and the selection of components.

In Austria, the "Voice over Internet Protocol" (VoIP) is being used for road management for the first time in the world. It was Siemens who developed and manufactured the IP-based emergency call stations. Thanks to a specially developed interface, emergency call stations of different manufacturers can now be connected to an emergency call center and networked together. The road management authority is therefore able to enjoy a high degree of flexibility in the organization of its emergency control centers and the selection of components.

The general parameters for tunnel solutions are changing continually. Tunnels are becoming longer, the number of trucks and private vehicles is increasing disproportionately, new safety standards are being defined in many countries and new technologies are resulting in new technical standards. Siemens is reacting to these changes with innovative solutions that embody completely new ways of ensuring safety and efficiency.

New ways for more safety and economic efficiency
Aberdeen tunnel, Hong Kong: old tunnel with the latest technology. The 1.8 kilometer long Aberdeen tunnel is the most important north-south traffic link on Hong Kong Island. We completely re-equipped the 20-year-old tunnel and converted it into a state-of-the-art traffic management system. The existing road tunnels are vitally important as they provide the only route between the two halves of the island. The old tunnel had already been equipped with the most modern traffic-management systems. The new design replaces them with the latest equipment, reducing the travel time between Central and Kowloon by 9.5 minutes, while employing the latest safety systems and driver-friendly traffic control equipment.

Rennsteig, Thüringen: all the equipment for Europe’s most modern tunnel project. We equipped Germany’s longest road tunnel, which is 7.916 kilometers long, with a new kind of technology which is unique throughout Europe. This includes a traffic computer center, traffic lights, variable LED traffic signs, induction loops in the breakdown bays and much, much more. The tunnel reduces the traveling time between Schweinfurt and Erfurt by 75 minutes, while employing the existing traffic management systems. The tunnel also has the latest safety systems and operates without any problems.

Seelisberg, Switzerland: replacement of equipment without interruption of the traffic flow. The 9.25 kilometer tunnel had been operating safely for 25 years when, in a project involving the complete replacement of the electro-mechanical equipment, we renewed the existing traffic management system. And we did this without interrupting traffic and without any problems.

Nefise Akcelik, Turkey: fully integrated solution for the longest tunnel in Turkey. The 3.8 kilometer Nefise-Akcelik tunnel is the longest of five tunnels, all of which have been equipped by Siemens, and is located on the road between Bolaman and Persembe. The tunnel increases the capacity of the road network next to the Black Sea. We provided the power supply, lighting, ventilation, the detection and video system as well as the tunnel radio and emergency call phones, the traffic monitoring and traffic control systems, the tunnel control center and system integration. A fully integrated solution according to a high standard of safety which Siemens will operate for a period of two years after completion.

**Tunnel experience all over the world**

<table>
<thead>
<tr>
<th>Tunnel</th>
<th>Country</th>
<th>Length</th>
<th>Our services/special features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aberdeen</td>
<td>Hong Kong</td>
<td>1800 m</td>
<td>LED and other traffic signs, radar measuring, traffic management center</td>
</tr>
<tr>
<td>Baregg/Zurich</td>
<td>Switzerland</td>
<td>1300 m</td>
<td>Traffic management system</td>
</tr>
<tr>
<td>Britz/Berlin</td>
<td>Germany</td>
<td>1713 m</td>
<td>Traffic control installation with median strip crossover system</td>
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<tr>
<td>Buenavista/Bogota</td>
<td>Colombia</td>
<td>4500 m</td>
<td>Complete equipment</td>
</tr>
<tr>
<td>Nefise Akcelik</td>
<td>Turkey</td>
<td>3800 m</td>
<td>Complete equipment</td>
</tr>
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<td>Rennsteig</td>
<td>Germany</td>
<td>7916 m</td>
<td>Complete equipment</td>
</tr>
<tr>
<td>Seelisberg</td>
<td>Switzerland</td>
<td>9250 m</td>
<td>Traffic management system</td>
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<tr>
<td>Karak</td>
<td>Malaysia</td>
<td>800 m</td>
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</table>

One of Siemens’ first tunnel projects was the 15 kilometer long Arlberg main tunnel in Tyrol/Austria. This was in 1978, almost 30 years ago. Since then, we have equipped so many tunnels all over the world that, if the tunnel tubes were placed in a line, they would be 500 kilometers long. The range of our tunnel systems includes the following projects: tunnels in the Czech Republic, tunnels in the USA, the UK, Austria and many other countries. Maintenance is also in good hands.

The Mrazovka tunnel in the Czech Republic is 2,554 m long and was completed by Siemens. And, with us, maintenance is also in good hands.

Equipment replacement without interruption of the traffic flow—no traffic jams! We also offered the possibility of installing a new tunnel without traffic jams. The Minden tunnel in Hong Kong is a 4.5 kilometer long tunnel with a benefit of new technology after 20 years. The tunnel has been equipped with the latest technology.

The Buenavista tunnel in Colombia was completely equipped by us.

500 kilometers of tunnel experience all over the world
Aberdeen tunnel, Hong Kong: old tunnel with the latest technology. The 1.8 kilometer long Aberdeen tunnel is the most important north-south traffic link on Hong Kong Island. We completely revamped the 20 year old tunnel and installed the most technologically advanced traffic signs based on LED and prism technology. The newly installed traffic control center now monitors the entire stretch of road and detects any accidents that occur. A newly-equipped traffic control center keeps everything under control.

Baregg/Zurich, Switzerland: traffic management system. We equipped Germany’s longest road tunnel, which is 7,916 meters long, with a new kind of technology that is unique throughout Europe. This includes a traffic management computer center, traffic lights, variable LED traffic signs, a rescue channel in the tunnel, video cameras that monitor the traffic flow between Schweinfurt and Erfurt for 75 minutes, while employing the latest safety systems and driver-friendly traffic control equipment.

Buenavista, Bogota, Colombia: complete equipment. Siemens has been a traffic systems partner of Bogota, the capital of Colombia, for more than 20 years. When the 4.5 kilometer tunnel on the road to Villavicenio was to be fitted out with the necessary technical systems, we received an order to provide all the equipment needed. Safety was an especially important aspect with the traffic lights frequently used by trucks carrying cattle and other livestock and the presence of a main road adjacent to the tunnel. We provided the complete range of services, from traffic control equipment and operation, to the latest traffic management systems, a newly-equipped traffic control center, and even video surveillance equipment, which was monitored by a traffic control center.

Seelisberg, Switzerland: replacement of equipment without interruption of the traffic flow. The 9.25 kilometer tunnel had been operating safely for 25 years when, in a project involving the complete replacement of the electro-mechanical equipment, we renewed the existing traffic management system. And we did this without any interruption of traffic and without any problems.

Nefise-Akcelik, Turkey: fully integrated solution for the longest tunnel in Turkey. The 3.8 kilometer Nefise-Akcelik tunnel, the longest of the five tunnels, all of which have been equipped by Siemens, and is located on the road between Bolaman and Persembe. The tunnel was completed as part of the expansion of the road network next to the Black Sea. We provided the power supply, lighting, ventilation, the detection and video systems as well as the traffic lights and emergency call phones. The traffic monitoring and traffic control systems, the tunnel radio and the emergency call phones, the tunnel control center and system integration. Siemens also takes on the maintenance of the system; the buildings and the equipment operate for a period of two years after completion.

**500 kilometers of tunnel experience all over the world**

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Technical tunnel systems from Siemens:
- Safety and Communications
- Energy and Lighting
- Traffic Control
- Security and Environment
- System Interfacing
- System Interfaces

A partner with added value – Siemens

Siemens is one of the world’s most successful suppliers of innovative technical infra-
structure projects. With its unique ability to integrate different technologies, people are making use of facilities for which Siemens can provide the required solutions from a single source and from a single mold.

The Siemens portfolio covers the whole range of technical systems that can be needed in tunnels. In their “basic” and, also, most innovative versions. This enables solutions for every community need. One size fits all – and is designed to inter-
act smoothly and without conflict or friction. And on top of this, there is only one contact partner for planning, configuration, installation and training as well as the provision of maintenance services and repairs.

Exactly the systems and products required to ensure the desired standard of safety. Siemens always supplies exactly what is needed: a single product, system or program or a complete system of solutions for existing tunnels and for new ones. It fulfills exactly the safety category which complies with the wishes of the customer and the applicable regulations. We implement solutions according to EU directive 2004/54/EC as well as to the national standards in other regions of the world. But we can, of course, go much further than these standards require.

Solutions which are also interesting in terms of financing and refinancing (O and P). So, we help to find viable solutions for customers who are looking for ways to finance their tunnels. This can include the financing models used today as well as refinancing solutions in the form of satellite-supported systems. In this area as well, we have now accumulated a wide range of experience from all over the world.

With success. The back-office system of the toll solution for the Austrian Brenner Freeway which we installed completely and ready-to-go in 1993 has been in use for all toll systems in Austria since 2001.

Looking for an all-round partner that can offer wide-ranging solutions for all technical aspects of traffic management and control in tunnels? Welcome to Siemens!
Siemens technical tunnel systems from Siemens: from a single source and from a single mold. The Siemens portfolio covers the whole range of technical systems that are needed in tunnels. In their “basic” and, also, most innovative versions. This entails advantages for every community. Everything fits in with and complements everything else and is designed to interact smoothly and without conflict or friction. And on top of this, there is only one contact partner for planning, configuration, installation and training as well as the provision of maintenance services and repairs.

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Solutions which are also interesting in terms of financing and refinancing. On request, we help to find viable solutions for customers who are looking for ways to finance their tunnel. This can include the financing models used today as well as refinancing solutions, in the form of satellite-supported toll systems. In this area as well, we have now accumulated a wide range of experience from all over the world.

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Technical tunnel systems from Siemens:
from a single source and from a single mold. The Siemens portfolio covers the whole range of technical systems that are needed in tunnels. In their "basic" and, also, most innovative versions. The systems address key topics for every community. Siemens builds up everything else and is designed to interact smoothly without conflict or friction.

And on top of this, there is only one contact partner for planning, configuration, installation and training as well as the provision of maintenance services and repairs.

Technically functional systems from Siemens are always supplied expertly. Siemens always supplies exactly what is needed: a single product, system or program or a complete system integration for existing tunnels and for new cases as well. And with exactly the safety category which complies with the wishes of the customer and the applicable regulations. We implement solutions according to EU directive 2004/54/EC as well as to the national standards in other regions of the world. But we, of course, go much further than these standards require.

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Looking for an all-round partner that can offer wide-ranging solutions for all technical aspects of traffic management and control in tunnels? Welcome to Siemens!
Siemens—430,000 people in 192 countries with a common goal: to complete projects to the customer’s full satisfaction.

From planning and realization to maintenance and service we are always involved in all phases of a tunnel project.

Wherever there is a tunnel project anywhere in the world, you can take it for granted that we will not be far away.

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Safe in
Safe through
Safe out

Tunnel systems from Siemens

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