

Case study

Industry Sector Building Technologies Division

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Safe Fun at Tivoli Gardens

The Copenhagen amusement park Tivoli Gardens relies on Siemens technology for fire safety

Almost four million guests visit the famous Tivoli Gardens amusement park in Copenhagen each year. With a sophisticated network of fire detectors and fire control panels from Siemens, visitors are efficiently and securely protected against the risk of fire and can enjoy the numerous attractions of the park without worry.

Tivoli Gardens, opened 1843 in Copenhagen, is the world's oldest existing amusement and recreation park. But Denmark's most well-known and popular tourist attraction is much more than that: it is a cultural institution, a preserver of traditions, a national symbol - and with almost four million visitors every year it is one of the most popular parks in Europe. Originally, Tivoli Gardens was located outside of Copenhagen's ramparts on the edge of the city. Those walls no longer exist, and the constantly growing city has now completely encompassed the park: Tivoli Gardens, together with the nearby central train station and the city hall, now form the heart of the Danish capital.

A total of 27 rides are spread out across the 8.3-hectare gardens including a roller coaster built out of wood in 1914 that is still running and the world's tallest swing carousel at 80 meters. Other attractions include the unique pantomime theater and Europe's longest salt-water aquarium whose 30 meters include a complete coral reef along with 1,600 fish, sharks, and rays. There are also two large concert halls and an outdoor area where concerts and other cultural events are regularly held during the summer months. 38 restaurants, cafés, and bars provide food and refreshments. The park is lit by around 120,000 lamps in the evening and by over two million lights during the Christmas season.

Fire safety under complicated conditions

Protecting an area of this size and with this many diverse uses from fire is no trivial task and requires comprehensive planning. Another challenge was the fact that Tivoli Gardens has very different shapes and sizes of its individual buildings, some of which are located very far apart from each other and some of which are very old.

The safety officers of Tivoli Gardens assigned the Building Technologies division of Siemens with the challenging task of protecting this odd collection of buildings, rides, and other attractions from fire. In doing so, they are putting their trust in the market leader for fire safety in Denmark. The fire safety experts from Siemens first attempted to divide the entire park into sectors, but this was not a simple task due to the complex topography of the park. Today the fire safety deployment consists of ten sectors that are each managed via a Siemens fire alarm system.

All of the rides and attractions in Tivoli Gardens, most of the restaurants including their kitchens, the management offices, and the technical rooms are protected by a total of 972 intelligent smoke detectors from Siemens. There are also 142 manual call points that are strategically positioned throughout the entire park.

Due to the unusual architecture of some of the buildings, special solutions were required and e.g. linear smoke detectors were installed. Some were installed in buildings with special ceiling construction and some in inaccessible areas as detection of cable ducts.

The automated Sinorix N₂ extinguishing system is used in the IT room of Tivoli Gardens. One of the reasons to use an extinguishing system with the extinguishing agent nitrogen is that it does not damage sensitive electronic equipment during the extinguishing process as it has poor electric conductive properties and because there will be no chemical reaction products – which might lead to damage to highly sensitive servers – when it comes into contact with fire. The natural agent nitrogen is also harmless to the environment and people¹. That ensures environmentally friendly extinguishing and allows the extinguishing area to be put into operation again quickly after flooding by means of simple overpressure ventilation.

Just like other extinguishing systems using natural agents, the Sinorix N₂ extinguishing effect is based on oxygen reduction (inertization) in the protection area: Flooding of the area with nitrogen typically lowers the oxygen percent by volume to 13.8 to 10 percent by volume depending on the fire risk, which deprives the fire of the oxygen it needs to burn. This will reliably extinguish the fire and prevent it from igniting again. Typical applications for Sinorix N₂ include data centers,

¹ Earth's atmosphere consists of around 78 percent nitrogen and around 21 percent oxygen. A fire dies out if the amount of oxygen falls below 13 percent by volume, but it is not a dangerous level for the people present.

telecommunications systems, cable ducts, electrical switching rooms, technical and machine rooms, and control rooms, as well as closed transformers, turbines, engines, and generators.

All of the fire safety installations in Tivoli Gardens are managed using the MM8000 danger management system from Siemens. Other safety measures are also integrated into this system, including the video surveillance systems that are also provided and installed by Siemens.

Learn more about fire safety solutions from the Building Technologies division of Siemens at www.siemens.com/firesafety

Learn more about Sinorix N₂ at www.siemens.com/sinorix

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The **Siemens Building Technologies Division** (Zug, Switzerland) is the leading provider of safe and energy-efficient buildings ("Green Buildings") and infrastructures in the world. As a service provider, system integrator and product supplier, Building Technologies provides building automation, HVAC technology, fire prevention, security, electrical installation technology and low-voltage energy distribution. With approx. 43,000 employees worldwide (as of September 30th 2009), Building Technologies achieved a turnover of around 7.0 million euro in 2009. www.siemens.com/buildingtechnologies