

CASE STUDY GOTTARDO, PMA FLEXIBLE CABLE PROTECTION SOLUTIONS

Flexible cable protection solutions

For the longest and deepest railway tunnel in the world



ABB has been at the forefront of technological progress in Switzerland and around the world since 1891 – from the efficient production of electrical energy, to enhancements to industrial productivity, right through to sustainable mobility.

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01 ABB PMA flexible, easy to install end-to-end cable protection with conduits, clamps and fittings, in exceptional climatic conditions.

The history of Swiss rail traffic is thus inseparably linked to the company's leading-edge technologies – from the historic Gotthardbahn rail network to today's Gotthard Base Tunnel, set to open in 2016. This project of the century stands for entrepreneurial spirit, innovation and quality – values which are all embodied by ABB. ABB was able to provide this outstanding project and its complex technical requirements with PMA cable protection solutions which meet the highest quality and safety standards.

The Gotthard Base Tunnel consists of two 57-kilometer-long single-track tubes. These are connected every 325 meters by cross passages providing emergency evacuation and maintenance access. The total length of the tunnel system is over 152 km including all cross-passages, access

tunnels and shafts. It joins the northern cantons of Switzerland with the southern ones, passing under the Swiss Alps. The 57 kilometers in length make it the world's longest tunnel. Rock ascends 2,300 meters above the tunnel, making it also the world's deepest railway tunnel constructed to date.

The 1.7 billion Swiss franc contract awarded to the Transtec Gotthard consortium is among the largest worldwide in this sector. This world-renowned project sets unique technological challenges and as such is an excellent global reference for products to be used in tunnel applications.



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01 End-to-end cable protection solution providing a high level of ingress protection against water and dust. More than 10,000 tunnel emergency guidance lights are connected via a handrail using PMA conduits, fittings and support clamps.

How to meet the very high demands of this outstanding railway tunnel project

Alpiq Burkhalter Bahntechnik AG is part of this consortium and chose ABB PMA Cable Protection to supply cable protection for the lighting system within the Gotthard Base Tunnel.

From control and monitoring systems to lighting and ventilation, building service facilities and water drainage, everything in this project is dependent upon a reliable power supply. Extremely high demands are placed on the 50 Hz power supply system.

Exceptional climatic conditions prevail within such long and deep tunnels. Air temperatures reach 40°C and above while regular medium-pressure wash-down procedures for cleaning the tunnel contribute to the 70% relative humidity in the air.

A lot of products currently available on the market are unable to meet the very high safety and reliability requirements under these climatic conditions.

Excellent fire safety characteristics are also essential for all products to be used for tunnel infrastructure applications and for rolling stock destined for prolonged use in tunnels.

Alpiq consulted with PMA, seeking a complete, high specification, end-to-end cable protection system with excellent fire safety characteristics (flammability, smoke density and toxicity) and a high level of ingress protection (IP68 and IP69K) to withstand the medium-pressure cleaning process. Alpiq has used ABB (PMA) cable protection systems for tunnel projects for several years but this project represented a new step in terms of the application requirements. Alpiq contacted PMA, a market leader in high specification cable protection systems, at the beginning of the project for recommendations and advice concerning a suitable flexible, easy-to-install, completely closed cable protection solution to be used in the Gotthard Base Tunnel.

Compliance with all major international product standards:

High-grade, specially formulated polyamide has excellent resistance to ultraviolet rays, weathering, and offers good impact strength. Polyamide products have outstanding fire safety characteristics in terms of low flammability, smoke/gas emission and toxicity in the event of a fire incident, which are especially important factors in this tunnel project.

PMA visited the customer to present PMA polyamide products. An intensive and very constructive discussion was followed up with a sample delivery, all of which convinced the customer of the virtues of polyamide cable protection for tunnel construction. At first, smaller installations under bridges and in tunnels were fitted with PMA products for testing. The outcome and results of this extensive testing were so convincing that Alpiq chose PMA products for this world-renowned project of the century. As a direct result of the good experiences with the test installation, ABB PMA was asked to deliver 21 kilometers of VAMLT conduit along with over 21,000 BVNZ strain relief fittings and BFH-0 conduit fixation clamps for the lighting system in the 57-kilometer-long railway tunnel.

More than 10,000 tunnel emergency guidance lights and 450 emergency exit light systems were subsequently equipped with ABB PMA cable protection products.

From the very beginning, the customer was very satisfied with the complete ABB PMA package of professional advice, customer support and a broad product range. One of the project managers responsible at Alpiq stated: “We have been looking for a flexible, easy-to-install, end-to-end cable protection solution that offers comprehensive protection for our electrical installations in these very demanding conditions.

PMA delivered a system that meets all of the demanding requirements specified for this project, such as ingress protection (IP), products free from halogen, and excellent fire protection. The fast response to requests for support and consultation, the variety of samples delivered free of charge, strict adherence to promised delivery dates and conditions, and the high quality of the components supplied were all important factors in our decision to award this large order to ABB PMA.”

“PMA’s polyamide-based cable protection systems offer numerous benefits for the customer”

Martin Güller, Business Development Manager at ABB EPIP (PMA) Uster, Switzerland, commented: “PMA’s polyamide-based cable protection systems offer numerous benefits for the customer. They possess excellent mechanical strength characteristics, such as compression strength and resistance to high energy impacts, combined with exceptional flexibility. They are corrosion-free and have a high level of ingress protection against water and dust, both of which are important factors in a very humid environment such as the Gotthard Base Tunnel. They demonstrate excellent resistance to numerous environmental influences such as chemicals, particularly cleaning agents, UV (if required) and rodents, and can be used in a broad range of operating temperatures. Add to this the long service life and speed of assembly, which reduces installation costs, and the high level of customer service PMA prides itself upon, it is easy to understand why Alpiq chose ABB (PMA) cable protection systems.”

04 450 emergency exit lighting systems are equipped with ABB PMA cable protection solutions to meet the highest safety standards in the 57-kilometer-long railway tunnel.

05/06 PMA Conduits and fittings: Excellent fire safety characteristics and IP68 ingress protection against water and dust according to EN60529. All products are free from halogens and have very high impact resistance.



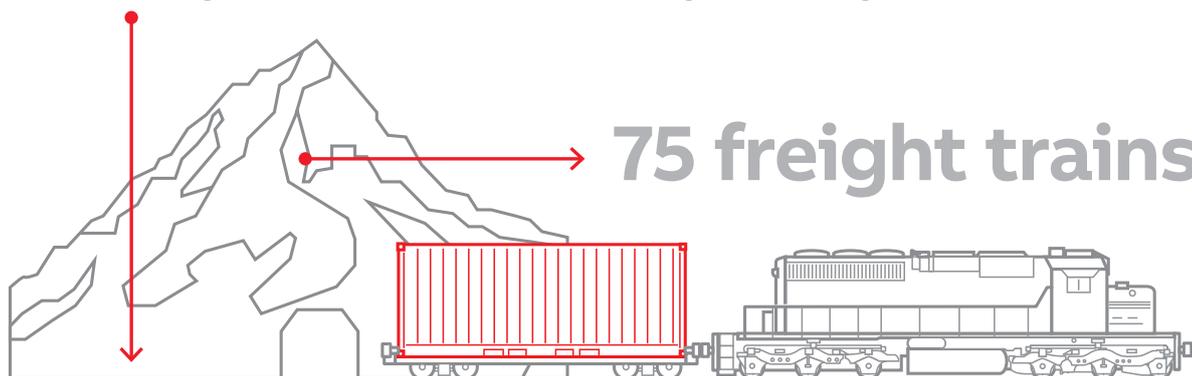
The world's longest and deepest railway tunnel

2300 Meters

At its deepest point, the Gotthard Base Tunnel runs more than 2 kilometers below the Piz Vatgira.

57 Kilometers

The tunnel stretches from Erstfeld to Biasca. It is approximately the same length as 75 freight trains arranged in a line.



260 freight trains

Higher capacity for rail traffic

A total of up to 260 freight and 65 passenger trains can pass through the tunnel each day. The tunnel thus contributes to the shift of traffic from road to rail.

Facts about the Gotthard Base Tunnel

The Gotthard Base Tunnel has virtually no gradients and its highest point is 550 meters above sea level. It will allow passenger trains to travel more quickly through the Alps and reduce the number of locomotives needed by freight trains. More than 20 million people in the catchment area between southern Germany and northern Italy will

benefit from the Gotthard Base Tunnel. Thanks to the level route, train connections will be faster, more reliable and more punctual. Passenger trains will travel every half hour on the north-south axis. The flat route contributes to protecting the Alpine environment. Cost of the Gotthard Base Tunnel: CHF 12.2 billion.