



Substations that can hide in a city Underground solution concepts

Out of sight, out of mind

Bustling urban centers need efficient and reliable electricity, but usually do not have space for large electrical installations. Placing the substation underground reduces space requirements at downtown sites, since the free surface area can be used for other purposes, such as shopping malls or parks. The purpose of underground substations is to provide all the functionality of a conventional substation while minimizing the area occupied above ground.

ABB's underground substation concept enables up to 98 percent of the installation's volume to be hidden. Only the cooling ducts and the access routes need to be above ground. ABB provides intelligent, state-of-the-art solutions to meet the most demanding requirements in safety, ventilation, equipment transport and maintenance access.

Underground transformer substations help to bring high-voltage electricity directly into the city center. The stations are environmentally friendly, almost unnoticeable, and have none of the planning problems encountered by surface-built solutions.

Building new transformer substations in inner-city zones or expanding existing facilities is a challenging remit: due to the lack of acceptance by the local community, the expense or a lack of space. However, the best way of meeting the rising demand for energy is to bring high-voltage electricity directly into the city to ensure highly reliable power supplies at an affordable cost.



Locating transformer substations underground (here underneath a roundabout) offers more scope for urban planners.

There is an increasing demand for compact and discreet transformer substations in city environments for urban development projects and other densely populated areas around the globe. Underground substations are not a new idea and many such installations are already in operation. ABB's approach to subterranean substations has been designed to accommodate planning regulations and address the evolving needs of our customers. Customer benefits include a near-invisible installation that blends into the surrounding landscape and is acceptable to the local community. The concept enables transformer substations to be integrated into any urban environment - underneath other buildings or building complexes such as shopping malls or in multi-storey car parks, beneath parks, sport stadiums and public squares as well as intersections or roundabouts.

A substation of this kind contains essential equipment such as transformers, gas-insulated, high-voltage switchgear, medium-voltage switchgear, automation, protection and control systems, auxiliary equipment for station services, AC and DC distribution boards, batteries, ventilation and air-conditioning systems, as well as fire protection systems.

ABB's modular portfolio enables customized solutions and allows projects to be completed more quickly. ABB has produced a manual to provide comprehensive execution guidelines and details of sample concepts covering the most important aspects of project execution. The concept can be adapted to individual customer requirements and planning is supported by 3D simulations.

Reliability, redundancy and safety eg, through separation of fire loads by bulkheads, are vital attributes of underground substations. During the initial planning work, certain restrictions have to be given particular attention, like temperature profiles of the surroundings, permissible equipment temperatures and heat dissipation, the space available in general, plus the space available for ventilation openings, the possible air velocity in air ducts and filters, the permitted noise emission levels, the composition and load-bearing characteristics of the ground, as well as the surrounding structures.



The above-ground footprint is required to be very small. In the sample concept, it accounts for a mere two percent of the substation's total volume. One important aspect to be considered is the optimization of the transportation and access routes: it must, for example, be possible to easily add or replace any piece of equipment including the station's largest items, the power transformers. Not least, human safety is of paramount importance. Although the stations are normally unmanned, redundant escape routes have to be provided on all levels. The concept also incorporates smoke-free zones such as the stairwells. Outside the substation, further safety aspects have to be taken into account as any potential hazards have to be confined to the station itself. Switching and transformer-related noise emissions, that are audible outside, have to be kept within specified limits.

Our comprehensive experience forms the basis for customized solutions integrating all the relevant aspects: from safety and aesthetics through to space economy. ABB's underground substation solutions enable the most stringent requirements for power supply within urban areas to be fully met - compactness, economy, reliability and safety. The concept ensures that urban substations are almost invisible to the general public.

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