

TOPCONÂ€™S MAGNET DRIVES FORWARD NORWAYÂ€™S MOST SPECTACULAR CONSTRUCTION PROJECT

Connecting Five Islands



Nordøyvegen is one of the biggest undertakings of civil engineering in Norway's history. The ongoing project plans to connect five islands in Ålesund Municipality to the mainland in Møre og Romsdal county, through a network of tunnels and bridges. Currently, residents and visitors are dependent on ferries, and this new road system will revolutionize their connection to the mainland. The construction process also involves improving the existing road network on the archipelago, bringing it in line with national standards.



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Large-scale road projects can be intricate and often quite difficult to manage and construct, especially when they link



several pieces of land across bodies of water. This project is unique in the fact that it actually involves all elements of civil engineering. Skanska won the bid for the project in autumn 2018 and, after using Topcon's MAGNET software to assess the magnitude of the work in the bidding process, they were able to achieve the most competitive quote, as well as having the strongest production plans. MAGNET has helped to optimize their entire digital workflow, bringing to life Norway's most spectacular construction feat.

"Nordøyvegen is a massive project built on islands, and building on islands is intrinsically challenging work," said Marianne Nærø, project manager at the Norwegian Public Roads Administration. "The work on the islands is completely dependent on ferry transportation and is challenging both for us and for Skanska as contractors."



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Excavation: a crucial and intricate stage

The cornerstone of this construction project is the excavation of rock and the subsequent use of the material to create sea fillings, which act as a stable base for the bridges. The rock used for these fillings is actually being retrieved from the tunnels currently being worked on, meaning all material is locally sourced. The most challenging aspect for Skanska is ensuring enough blast rock is retrieved to create a base, and that it is extracted according to schedule. If this part of the build is held up or delayed, then it will have a huge knock-on effect further down the line, hindering the sea filling team, the foundation team and eventually the bridge building team.

When creating roadways that connect land mass divided by bodies of water, a stable base is vital to the construction process, meaning that the excavation, production and transportation of blasted rock is arguably the most important step in the whole project. It's therefore imperative that this runs smoothly and that Skanska has an optimized digital workflow. This is where Topcon's MAGNET Project software comes in, as the platform can be used to manage, plan and evaluate the entire project.

MAGNET Project provides everything needed for an entirely streamlined digital earthworks workflow, giving the contractor the ability to plan, manage and follow-up the project, evaluate different production options and costs, and create realistic and accurate earthwork plans visualized on a map. The software also supports line-of-balance scheduling through the use of a unique time-versus-location diagram, with mass haul optimization and an interactive map of the construction site integrated into the tool. This allows for location-based construction planning and scheduling, helping project managers to find the most efficient construction sequences and avoid production interruptions, resource clashes and construction delays all in one go. This kind of application can save an abundance of time on jobs as big as Nordøyvegen as well as boost workflow and project efficiency.



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Oversight of the entire project

By using MAGNET, Skanska has been able to ensure that the excavation and hauling of rock has been seamless. The team has even been able to use Topcon's software to assess and map out how much material is needed for each sea filling, as well as how much rock they have available. This saves time and money, and helps the team to plan and adhere to their build schedules accurately.

Another issue that the software has helped to overcome is the vastness of the build area. Mehdi Hosseini, project planner for Skanska, said: "One of the advantages of MAGNET was that for a project like Nordøyvegen, which is a geographically scattered site with areas that are far apart, it helped us visualize the entire strategy for the project in one go."

By being able to view the project production plan in its entirety on one page, Skanska had clear oversight of what the end result will be, with the 'line of balance' feature enabling everyone to work on a common strategy and find ways to optimize progress at different stages. The software also specifies which part of the site materials need to be delivered to, making logistics mix-ups a thing of the past. Mehdi continued: "MAGNET helped us map out the material available to us through tunnelling, as well as how much mass was needed to fill specific parts of the seabed. It was also useful for optimizing the logistics of blast rock transportation."



Topcon's MAGNET software has helped to optimise Skanska's entire digital workflow, bringing to life Norway's most spectacular.

As the build progresses, [MAGNET software](#) will continue to be used as an integral part of Skanska's strategy. The straits which will host the bridges and tunnels are an incredibly busy shipping route, which cannot be closed for long periods of time during the build. Therefore, a comprehensive digital workflow is more important than ever. The foresight MAGNET also gives regarding material use on site enables transport and logistics to be completely aligned, reducing delays by eliminating the possibility of certain teams running out of necessary materials.

"A great advantage is the ability to gather all your information in once place," added Grzegorz Gucwa, production manager at Skanska. "You can check in on what's happening at different locations daily. You can also see how various activities interact and progress and, above all, it helped us plan the project starting from an early tender stage. Now, in the construction phase, it helps us realize our strategy and lets us keep tabs on all daily operations."

The benefits of an efficient workflow

Topcon's MAGNET software has a solid track record of supporting huge infrastructure projects like Nordøyvegen. Niclas Törnroos, senior consultant at Digital Construction Works, a joint venture formed by Topcon and Bentley Systems, has been working as a consultant on such projects for eight years. Niclas said: "It's exciting to be part of these projects and to see our MAGNET suite of software products helping to facilitate such an impressive large-scale project. We thoroughly enjoy collaborating with partners like Skanska and their talented people, especially when we are supporting decision-making right from the bidding stage and throughout the entire build process."

"It's always rewarding to be involved in builds that are going to make a difference to thousands of people and the introduction of this transport connection will have huge benefits on the local community for years to come."



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Marianne Nærø, from the Norwegian Public Roads Administration, added: "Connecting all these islands to the mainland is what makes the Nordøyvegen project special. It's an honour to work on this project because it's very much in the public eye and the locals seem to be really excited about the new roads. It's great to be able to work on a project that's appreciated by the community. Furthermore, Nordøyvegen will boost local business, as well as enable locals to cooperate in crucial planning for education, healthcare and other governmental services."

The Nordøyvegen project is a vital necessity for the 2,700 residents of the islands and means they will be connected to Norway's mainland without being dependent on ferries, for the first time. Thanks in part to the level of efficiency afforded to Nordøyvegen by Skanska with the help of Topcon's MAGNET software, the project is expected to be completed in May 2022 – making the total build time for this vast undertaking just over three years.

For more information about Topcon's MAGNET software suite, visit www.topconpositioning.com/magnet-software-suite



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