



CONSTRUCTION INNOVATION AND  
TECHNOLOGY APPLICATION CENTRE  
建造業創新及科技應用中心

# Report on CITAC Study Tour 2023



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2023 Construction Industry Council

# 1. Introduction

- 1.1 The construction industry is undergoing a transformation driven by digitalisation, automation, and increased utilisation of Information and Communication Technology (ICT). To gain insights into international industry trends and innovation adoption, the Construction Industry Council (CIC) organised a study tour to European countries in 2023. The tour focused on five areas: Industry 4.0 strategy, automation, robotics and machinery, digital design, and green sustainability.
- 1.2 This report summarises the observation and valuable insights into international industry trends, innovation adoption, and digital practices in the construction sector.

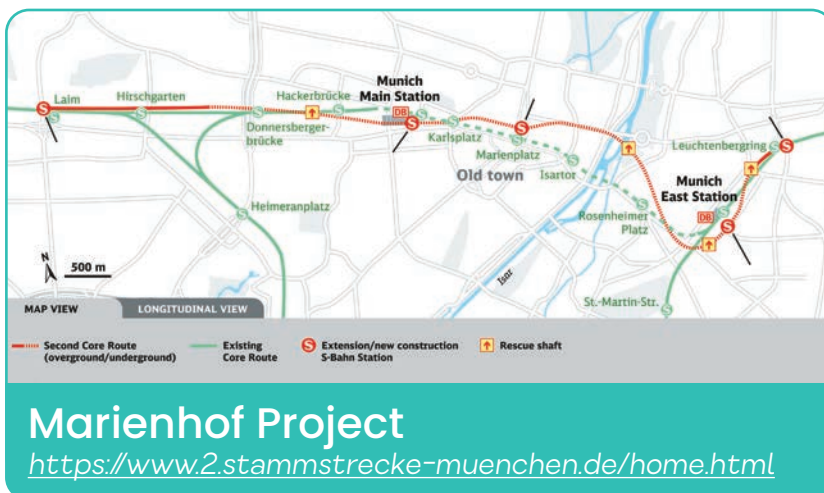
# 2. Site Information

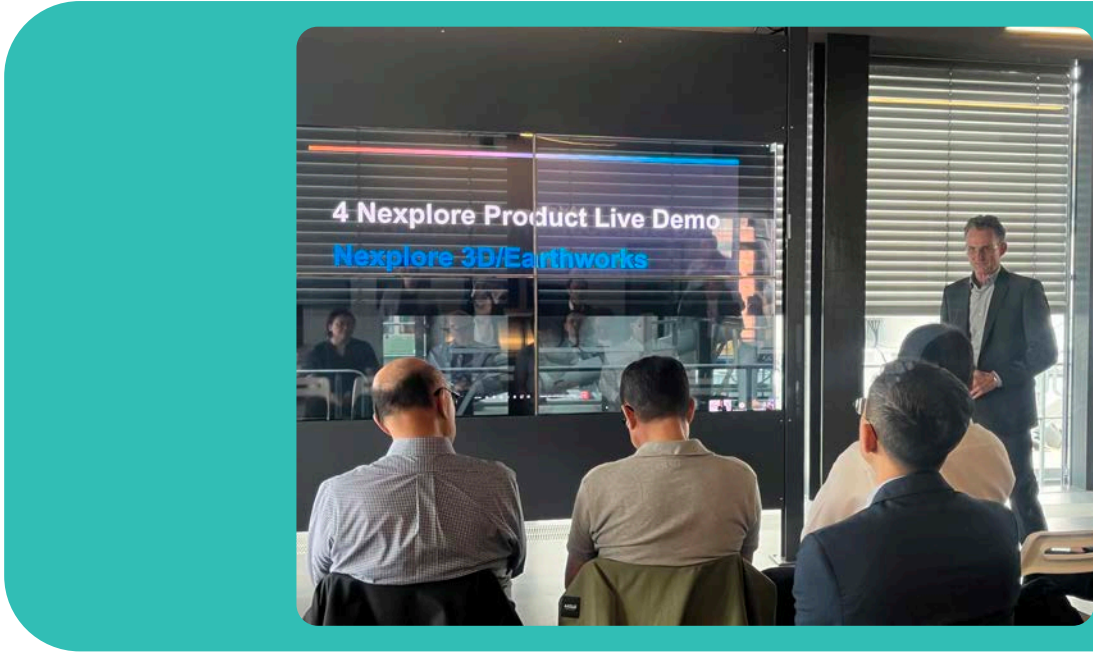
## 2.1 Construction Site of Marienhof Station

The construction site of the 2nd S-Bahn main line in Munich, which is the second trunk route envisages an additional underground inner-city link and runs roughly parallel to the first trunk route in the centre of Munich, which was opened in 1972.

The project consists of a central access structure and platform tubes as well as a connecting tunnel to the metro underground (U-Bahn), extensive dewatering and geo-monitoring measures as well as compensating grouting works.

In this project, the project team managed small site installation surrounded by prominent buildings, a pedestrian zone, and narrow streets and installation of heavy diaphragm wall with integrated sonic control pipes.





## **2.2 Hochtief's Innovation Roadmap and Digital Practices**

Hochtief is one of the largest contractors in Germany. Focusing in Australia, North America and Europe, it is an engineering-led global infrastructure group with leading positions across its core activities of construction, services and concessions/public-private partnerships (PPP).

The Hochtief adopted several digital solutions that may be suitable for adoption by the Hong Kong construction industry.

Firstly, the concrete app, which provides a digital solution for concrete ordering, delivery, quality control, and documentation. This app streamlines processes, reduces waste and ensures the highest quality standards are met.

Secondly, the Hochtief roadmap on digital design and construction processes provides a clear path for the integration of digital tools and practices into all aspects of the construction process, resulting in increased efficiency and productivity.

MINERVA, a digital tool that tracks all subcontractor information and project data. This tool enhances transparency, communication, and collaboration, ensuring that all stakeholders are kept up to date with the project progress.

Hochtief is anticipated the application of blockchain technology could further streamline and effective process with high data integrity and security could be achieved.

Lastly, 3D Earthworks tool which allows for accurate and efficient earthworks volume calculations, reducing waste and increasing productivity was also presented to the delegation during the visit.

## 2.3 Digital BAU Exhibition

The digital BAU, a trade fair focusing on digital solutions and technological innovations in the construction industry. It brought together architects, planners, engineers, and construction professionals to discuss and showcase the latest advancements in digitalisation, software and technology for the built environment. The trade fair featured over 90 European ConTech startups and technology companies in three main areas:

- (i) Digital Twin
- (ii) Connectivity
- (iii) Urbanization



In Digital BAU, six key technology companies were identified for future collaboration. They are:

1. **Conbotics**, a company known for its painting robot that can efficiently and accurately paint large surface areas with minimal human intervention.
2. **Clone it**, a company that offers a software tool to simulate a wide variety of reinforcement reduction scenarios, allowing for the optimisation of concrete structures and reducing material costs.
3. **Doka**, a company that specialises in formwork generation in both 2D and 3D using Building Information Modelling (BIM), resulting in increased efficiency and accuracy in the construction process.
4. **Procore**, a company that offers an all-in-one construction management software, providing a centralised platform for project management, financials, quality control and safety.
5. **Nemetschek**, a leading provider of digital solutions that cover the entire life cycle of construction and infrastructure projects. Their solutions, such as Graphisoft and ALLPLAN, provide BIM modelling, project management and collaboration tools for architects, engineers, and construction professionals.
6. **BIM Permit**, a company that has developed code-compliance checking based on BIM and related authoring tools, ensuring that buildings are constructed according to regulatory standards and reducing the risk of costly errors. These companies are just a few examples of the exciting advancements in technology that are transforming the construction industry.



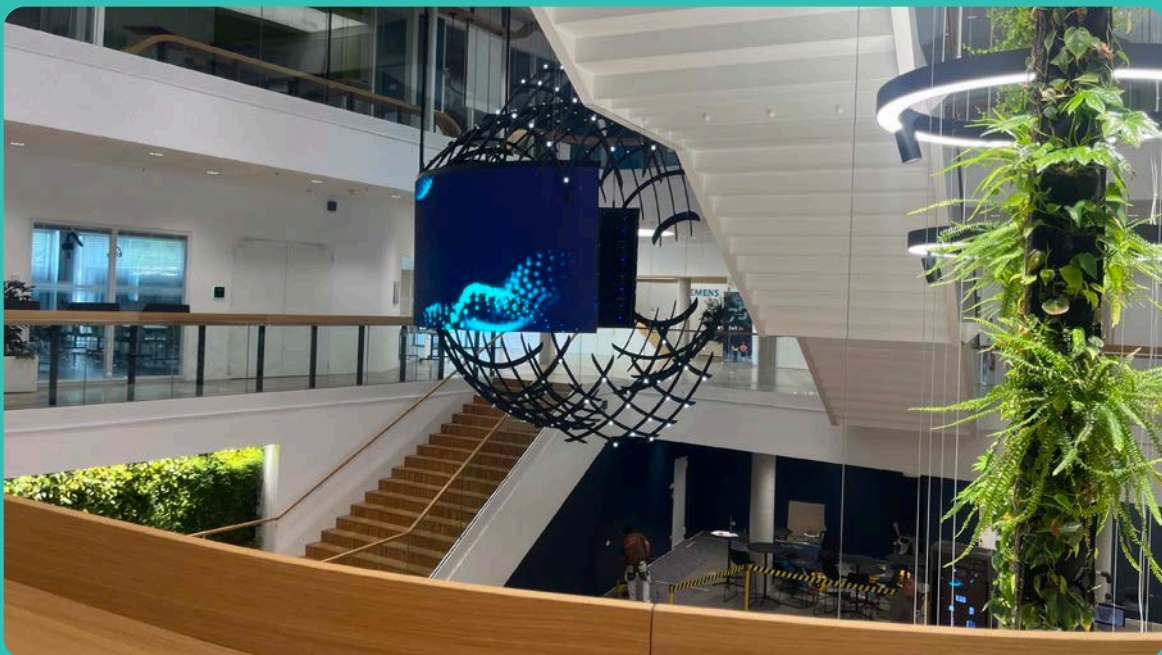
## **2.4 Siemens Factory Tour**

The WEF Lighthouse factory – the Siemens “Lean Digital Factory” (LDF), which was initiated to further strengthen automation and digitalisation and shop floor productivity from data and analytics based on lean production philosophy. In this factory, visitors could experience the innovative technologies such as edge computing or artificial intelligence, which are significant for tomorrow’s autonomous production.

Lean manufacturing specialises in maximising productivity while minimising waste within a manufacturing operation. By adopting a Lean approach, manufacturers can optimise their processes to reduce lead times, improve quality and increase efficiency.

Another important aspect of Industry 4.0 is the use of artificial intelligence (AI) and robotics for automation. These technologies can help to streamline processes, reduce errors and lower costs by automating repetitive and time-consuming tasks. They can also streamline the inspection process by eliminating the need for human intervention.

Overall, Industry 4.0 technologies such as Lean manufacturing concepts, AI and robotics, data analytics, and collaboration are transforming the operation of manufacturing plants, resulting in increased efficiency, productivity and profitability. The construction industry could be benefited by embracing the Industry 4.0 technologies.



**Siemens impulse Centre**

<https://www.siemens.com/global/en/company/topic-areas/impulse-visitorcenter.html>



## **2.5 Liebherr-Werk Nenzing GmbH Plant Visit**

Liebherr-Werk Nenzing GmbH specialises in battery-powered construction machines including crawler cranes and duty cycle crawler cranes, as well as piling and drilling rigs.

There are three key takeaways from the visit:

- (i) The next generation environmental-friendly cranes are ready to market. Liebherr produces cranes with no noise, no emission and is remote controllable. Those machinery will be suitable to achieve carbon neutrality in Hong Kong's construction sites.
- (ii) Liebherr's in-house apprenticeship programmes which provide on-the-job training and education to the youths. It is one of the reasons why Liebherr could have achieved a long-term guarantee of skilled personnel and trained-up new talents.
- (iii) Liebherr's innovative digital solutions support machine operators in understanding the site conditions. These solutions, including remote control systems and tower crane simulators for training, enable machine operators to work more efficiently and safely, resulting in increased productivity and reduced risk of accidents.



### **Liebherr-Werk Nenzing GmbH**

<https://www.liebherr.com/en/nzl/about-liebherr/liebherr-worldwide/austria/nenzing/nenzing-gmbh.html>





**Hilti**

[https://www.hilti.com.hk/c/CLS\\_CORDLESS\\_TOOLS\\_7123](https://www.hilti.com.hk/c/CLS_CORDLESS_TOOLS_7123)

## **2.6 Hilti HQ & Innovation Centre**

Hilti Corporation develops, manufactures and promotes products for the construction, building maintenance, energy and manufacturing industries mainly to the professional end-users. It concentrates mainly on anchoring systems, fire protection systems, installation systems, measuring and detection tools, power tools and related software and services.

During the visit, the Hilti innovation team introduced their latest development on firestop system, structural connection system for timber structure, the latest version of connected hand tool and MiMEP integrated solutions to the delegation.

Hilti showcased their latest development on the structural connection system and firestop system for timber structure. The technology could be transferred to the pre-cast concrete component.



## 2.7 Schindler Holding Ltd.

Schindler Holding Ltd. is a Swiss multinational company which manufactures escalators, moving walkways and elevators worldwide. It was founded in Switzerland in 1874.

In this study tour, Mr. Michael DOBLER, Head Global Account Management, introduced the Schindler City Center and PORT Innovation Lab to the delegation. Their team also shared with the delegation their sustainability road map and the latest development on automation and robotic system and their PORT mobility solutions.

The Schindler CLIMBLift is a self-climbing and vertical transportation system that can be used in high-rise construction to move people and materials. The CLIMBLift is an efficient and safe way to transport workers and materials to different levels of a building during construction, without the need for traditional scaffolding.

The Schindler Robotic Installation System for Elevators (Schindler R.I.S.E) can complete a floor - drilling and setting the anchor bolts independently. The use of R.I.S.E not only increases productivity, but it also enhances safety.

Schindler PORT (Personal Occupant Requirement Terminal) is an advanced elevator destination control system that assigns passengers to a specific elevator car based on their desired floor before they enter, improving efficiency and reducing waiting times. It was a seamless mobility experience for guests.



### Schindler City

<https://www.schindler.com/en.html>





## **2.8 ETH & DFAB House**

Institute of Technology in Architecture (ITA), Eidgenössische Technische Hochschule Zürich (ETH Zurich), is a leading platform for research and teaching of technology in architecture, in disciplines such as structural design, digital fabrication, energy and building systems, building processes and computational design.

The Robotic Fabrication Laboratory (RFL), which is set up as a worldwide unique digital construction environment that accommodates internationally leading research in the field of robotic fabrication in architecture and construction.

The DFAB House, which is located at Next Evolution in Sustainable Building Technologies (NEST), the modular research and innovation building of EMPA and EAWAG. At NEST, new technologies, materials, and systems are tested, explored, further developed, and validated under real conditions. Close cooperation with partners from research, industry and the public sector ensures that innovative construction and energy technologies are put into the market faster. NEST contributes to making the use of resources and energy more sustainable and circular.

The NEST is an experimental building that serves as a testbed for new technologies and solutions, with a focus on creating buildings that are responsive to the environment and the needs of their occupants. The platform also aims to foster collaboration among researchers, industry partners and other stakeholders to accelerate the development and adoption of sustainable building technologies.

ETH Zurich's research focuses on developing new techniques and solutions for post-tensioned timber construction, with a goal of creating sustainable and efficient buildings. The use of timber in construction is becoming increasingly popular due to its sustainability and low environmental impact, and post-tensioned timber construction is a way for constructing high-rise timber buildings.

## 2.9 SAEKI Robotic Visit

SAEKI Robotic, which is a startup company that develops robotic digital manufacturing platform intended for the construction industry. The company develops a process that combines robotics, 3D printing, milling, post-processing and 3D scanning to create large-scale components, on-demand and cost-effectively, enabling the clients to save time and money while streamlining the whole process.

ETH Zurich has a range of research groups focused on digital fabrication and related fields. There are also several startups and companies in Zurich that are leveraging digital fabrication technologies to create innovative products and solutions for construction industry.



### SAEKI Robotics

<https://www.saeki.ch/>



# 3. Conclusion

- 3.1 The study tour captured tips on good management practices for maintaining clean and tidy construction sites and factory environments. Furthermore, the delegation received insights on tackling the shortage of labor and boosting productivity and sustainability through various means.
- 3.2 From this tour, we learned about adopting robotic solutions, digitalising workflows, and using sustainable materials such as timber, along with monitoring their performance. Additionally, we also gained knowledge on developing low carbon emission machinery and understanding innovative operations from a manufacturing perspective.
- 3.3 Overall, the tour provides informative and engaging experience during the visits to European counterparts.



# Site Information

## **Marienhof Project**

<https://www.2.stammstrecke-muenchen.de/home.html>

## **Hochtief AG**

<https://www.hochtief.com/>

## **Siemens impulse Centre**

<https://www.siemens.com/global/en/company/topic-areas/impulse-visitorcenter.html>

## **Liebherr-Werk Nenzing GmbH**

<https://www.liebherr.com/en/nzl/about-liebherr/liebherr-worldwide/austria/nenzing/nenzing-gmbh.html>

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