AEC
Excellence
Awards
2018

AUTODESK

FOREWORD

The phrase "less is more" has taken on a new, urgent meaning for the AEC (Architecture, Engineering, and Construction) industry.

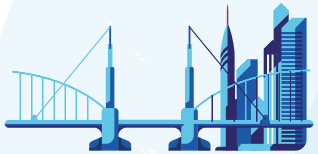
The global middle class is growing faster than at any time in history, creating an ever-increasing demand for buildings, housing, and infrastructure. But we're faced with the reality of meeting this demand at a time when we have less: less material and resources to build with; a diminishing skilled labor pool; and the need to expand our communities in a way that has less of an impact on our already fragile environment.

Finding a way to address our need for more, but to do it with less is simply put the biggest design opportunity we've ever had.

The solution is at our fingertips—it's through embracing technology to reimagine the processes of design and construction. Even in the face of needing more with less, there is a way to make things better. That's exactly what we see with this year's AEC Excellence Awards 2018 winners.

These exemplary projects from around the world demonstrate that a project—no matter the size—can find incredible results through a concerted, collaborative effort and the use of technology. We congratulate these winners on their achievements and success. They are shining examples for us to learn and apply throughout the AEC industry.

Nicolas Mangon
Vice President
AEC Business Strategy
and Marketing, Autodesk



INFRASTRUCTURE DESIGN

Population growth, urbanization, and economic expansion are pushing the demand for infrastructure to unprecedented levels. With the inherent large investment of infrastructure projects, the industry must take even greater strides to do more with less. That means a laser focus on coordination and collaboration with BIM.

Involving stakeholders in real time—in all phases from planning to community feedback and contractors on site—provides the opportunity for greater efficiencies and less rework. A single view with all data available anytime and anywhere brings teams together to share models and improve project workflows, resulting in better infrastructure in less time.

In the following pages, the AEC Excellence Awards 2018 Infrastructure winners showcase how the future of infrastructure is taking place right now and in incredible ways.

JUDGES

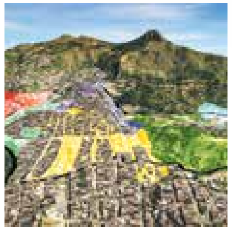
JACK CHENG
Associate Professor of Hong Kong University of Science and Technology (Department of Civil and Environmental Engineering)

LACHMI KHEMLANI
Founder and Editor
AECbytes

MARK SCACCO
Co-Founder and COO
Scacco, LLC

JOAQUIN DIAZ
Professor of Information Technology in Engineering and Scientific
Technische Hochschule Mittelhessen - University of Applied Sciences

SHENG LIMING
President of China Railway BIM Alliance



SMALL PROJECT

MIB - MICRO-SCALE URBAN PLANNING METHODOLOGY

Empresa Desarrollo Urbano de Medellín

MEDIUM PROJECT

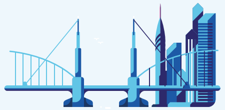
WUHAN-XIANGYANG-SHIYAN RAILWAY

China Railway Siyuan Survey and Design Group

LARGE PROJECT

THE PARALLEL LINE OF THE FOURTH DIVERSION EXPRESSWAY

Chongqing Municipal Research Institute of Design
Chongqing City Construction Investment (Group) Co., Ltd.
Chongqing City Construction Development Co., Ltd.



INFRASTRUCTURE DESIGN

small project

(less than $100 Million)

Project:
MIB - Micro-scale urban planning methodology

Firm:
Empresa Desarrollo Urbano de Medellín

Owner:
EPM (Empresas Públicas de Medellín)
Alcaldía de Medellín

Location:
Medellín, Colombia

Software:
Autodesk® AEC Collection

> *For public planning at any scale, 3D visualization can play an important role in communicating with people. It provides a clear basis to share ideas and to gather feedback. Decision-making becomes more collaborative.*
>
> *– Nicolás Rivillas Hincapié, Assistant Director of Design and Innovation, Empresa Desarrollo Urbano de Medellín*

MICRO-SCALE BIM MEETS MACRO-SCALE VISION

Planners use BIM to improve neighborhood safety in landslide-prone areas

Colombia's second-largest city, Medellín, is located in the Andes Mountains roughly 1,500 meters (4,900 feet) above sea level, and much of the city's development extends up the sides of the area's many mountains. Some of that development took place with little or no planning, with neighborhoods forming as people built small dwellings on available pieces of land. However, many of these vibrant communities are located on land at high risk of dangerous landslides. A public entity, the Empresa Desarrollo Urbano de Medellín (EDU) used BIM (Building Information Modeling) tools in the Architecture, Engineering & Construction Collection to plan safer communities for people living in these areas.

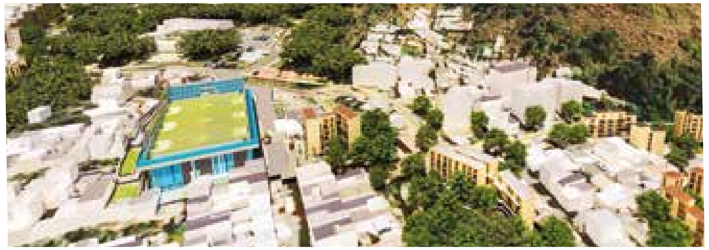
KEEPING THE LOCAL PICTURE IN VIEW

Called MIB, which is a micro-scale urban-planning methodology, EDU's approach on the project makes it a priority to consider micro-scale planning in relation to the macro scale of the city as a whole. The goal is to ensure that people in affected communities gain access to much more than just safer housing. Improved transportation, sanitation, and parks—plus residents' ability to contribute to the planning process—are all part of MIB and to help win community support.

The EDU team wanted to start the project with a whole-city view showing the affected communities in relationship to transportation, city services, and parks. But they lacked the funds to undertake a manual survey. Just as importantly, the team recognized the need to turn any planning and design outputs into materials that people in affected communities could easily review.

"MIB takes place at the city level, or macro scale, and the neighborhood level, or micro scale," says Nicolás Rivillas Hincapié, assistant director of design and innovation at EDU. "We want to make neighborhoods safer for people and also take their opinions into account. Community communication is critical with MIB. We saw BIM technology as a vehicle for technical design and as a way to easily create visually clear communications of a complex project."

Pinares de Oriente Polygon - Image courtesy of Empresa de Desarrollo Urbano



Detailed intervention areas - Image courtesy of Empresa de Desarrollo Urbano

A 3D PLANNING MAP FOR MEDELLÍN

To start the project, EDU gathered information from several GIS (geographic information system) databases in the city, including those for utilities, transportation, and the city overall. The team brought that information, along with orthographic photos, into InfraWorks infrastructure-design software and used it to create a 3D city map. Using Civil 3D engineering-design software, the team created preliminary models of slopes, cuts, fills, and other engineering information for the affected areas.

By bringing this data into InfraWorks, team members created a 3D model that included both existing conditions and proposed site changes. They generated concept models for new parks and transit enhancements in Civil 3D and turned to Revit building-design software to create new housing concepts for the communities.

The intelligence of the Revit models let the team evaluate basic construction and material requirements, providing early visibility into potential costs and helping keep designs aligned to budget. To improve the energy performance for the new housing, the team used Insight to explore the energy implications of design choices in the earliest design stages. For instance, Insight helped the team choose an energy-efficient orientation for the buildings with respect to the sun.

REACHING THE COMMUNITY WITH 3D MAPS AND RENDERINGS

When the initial planning was ready to share with the community, EDU created a 3D model representing the entire city, with a detailed project planning area of more than 40,000 square feet. The team also used InfraWorks to communicate the project's city-scale implications. City leaders and community members could see the project in the context of the entire city and its infrastructure.

For more detailed reviews of proposed housing, EDU used Navisworks project-review software to create 3D fly-throughs of the Revit design models. EDU also used Autodesk Rendering, a cloud-based service, to create photorealistic images of the proposed building and other changes. These renderings captured high-resolution views of what the plan would look like when complete.

EDU shared these visualizations—3D maps, fly-throughs, and renderings—with the community and used them to gather input and comments at events. To maximize information availability, EDU posted project information that included QR codes so community members with smartphones could then scan the codes and easily access project visualizations.

EFFICIENCY WINS WITH THOROUGH PLANNING

As MIB advances, EDU expects work to begin in the near future on new housing in the affected neighborhood with the most pressing need. EDU credits its BIM-powered planning process with helping the project move forward more quickly. The team estimates that the planning process took 45% less time thanks to BIM tools within the AEC Collection, including Civil 3D, InfraWorks, Revit, Navisworks, and Insight software. A model-based approach improved quality as well, with the team estimating that the new housing will be 28% more efficient and constructible.

Project full context - Image courtesy of Empresa de Desarrollo Urbano

INFRASTRUCTURE DESIGN

medium project

($100 Million - $500 Million)

Project:
Wuhan-Xiangyang-Shiyan Railway

Firm:
China Railway Siyuan Survey and Design Group

Owner:
China Railway Corporation

Location:
Hubei, China

Software:
Autodesk® AEC Collection
Autodesk® BIM 360®
Autodesk® Vault®
Autodesk Inventor®

"On infrastructure projects, BIM can effectively help project teams find the best options while avoiding problems, such as error and interferences. It improves overall engineering quality

– Hua Xie, IT Supervisor, China Railway Siyuan Survey and Design Group"

MAKING HIGH-SPEED RAIL DESIGN FASTER

Innovative BIM process accelerates bridge and tunnel design

The Wuhan to Xi'an high-speed railway project includes the Wudangshan Station to Wangjiazhuang Tunnel segment—a passenger line spanning 8.3 kilometers (approximately 5 miles). At an expected cost of $160 million, the line required the collaboration of experts in tunnel, bridge, station, and rail-line design. More than 50 design and engineering professionals from the China Railway Siyuan Survey and Design Group joined the project team, and together they completed the design quickly. How did they do it? They collaborated to automate and improve BIM (Building Information Modeling) design processes using software tools in the Architecture, Engineering & Construction Collection.

BIM UNITES PROJECT TEAM

The first project hurdle consisted of choosing the best route for the railway that would travel through mountains and over rivers and lakes. The project team wanted to avoid unnecessary construction challenges by selecting an optimal route that would minimize the number of bridges and tunnels that would need to be built. If the team worked on each tunnel and bridge as though it were a separate project, completing the design of the entire project would take a long time.

The team knew that BIM would play a role in overcoming the project's design challenges, but it also knew it needed a way to work closely and easily access all of the design models. As an early step in the project, the team turned to Vault data-management software. Using multiple servers to run Vault on a private cloud, the team organized and shared design models, managed documentation, and tracked revisions.

COLLABORATING WITH A 3D GEOLOGIC MODEL

To choose the exact route for the line, the team brought mapping data, imagery of the area, and geologic data together in InfraWorks infrastructure-design software and Civil 3D software. Then, using virtual-reality (VR) technology, the team mapped the optimal route.

With a large model of the overall route completed, team members developed an innovative way to speed the design of the tunnels and bridges. They created a database that included parameters for tunnel designs. Using this database and a library of tunnel-model options in Civil 3D, they generated a basic tunnel framework for the required tunnels. With the Dynamo Studio computational BIM design tool and Inventor software—traditionally a manufacturing application—they undertook a similar process to automate portions of the design process for the project's bridges. Combined, these techniques let the team design the tunnels and bridges in a fraction of the time it would have taken using traditional processes.

Panorama - Image courtesy of China Railway Siyuan Survey and Design Group

3D PRINTING ADDS CLARITY

To gain another perspective on the design, the team 3D-printed portions of the station and other design features. It was able to use the 3D prints on the go to communicate with stakeholders, overcoming the shortcomings of the limited visual angles presented by 3D images printed on paper and 3D video. VR technology also played a role in the design of Wudangshan Station, with the team exploring the design details in an immersive visualization. The team estimates that the use of VR and 3D printing helped to reduce the rework rate by as much as 10%.

With a goal of further reducing risk of rework, the team used BIM 360 software to coordinate the design of the station. A cloud-based solution, BIM 360 helped team members work together to find and address interferences in the design. Collision analysis revealed 116 points of interference between pipes and columns—saving nearly $500,000 on that portion of the project alone.

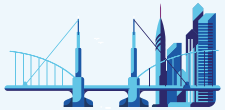
6 TUNNELS AND 10 BRIDGES IN LESS THAN 2 MONTHS

With the many disciplines on the project using model-based processes and tools within the AEC Collection, the Wudangshan Station to Wangjiazhuang Tunnel section of the Wuhan to Xi'an project is among the first rail projects in China to rely entirely on a BIM process.

The team believes that the project's success will serve as a reference for other similar projects within the country, and it has impressive results to support that belief. For instance, after choosing the best route for the rail line and setting up a more automated design process, the team was able to design six tunnels and 10 bridges in just six weeks. The precision of the design enabled extensive use of prefabrication to construct the railway station, accelerating installation of key portions of equipment by as much as 60%.

"By means of our forward-thinking design approach and proactive planning, we completed the design for six tunnels and 10 bridges in just 1.5 months," says Hua Xie, IT supervisor on the project. "We were able to use the tools within the AEC Collection to help us speed the completion of repetitive design tasks, which helped us improve design efficiency for the tunnels and bridges."

Subgrade and tunnel. Image courtesy of China Railway Siyuan Survey and Design Group



INFRASTRUCTURE DESIGN
large project
(over $500 Million)

Project:
The Parallel Line of the Fourth Diversion Expressway

Firm:
Chongqing Municipal Research Institute of Design

Owner:
Chongqing City Construction Investment (Group) Co., Ltd. and Chongqing City Construction Development Co., Ltd.

Location:
Chongqing, China

Software:
Autodesk® AEC Collection

> *Large infrastructure projects like the Parallel Line of the Fourth Diversion Expressway have complex environmental conditions and many design elements. Beyond the challenges of the design program, communication and coordination across a large team can be difficult. The BIM process helped us see the project as a whole and work together more seamlessly.*
>
> *– Xiaoyang Zhang, Professorate Senior Engineer, Chongqing Municipal Research Institute of Design*

$4+ BILLION EXPRESSWAY CONNECTS BUSY CITY

BIM-powered integrated workflows improve 28-kilometer project that includes tunnels, bridges, and interchanges

Located in Chongqing, China, the Parallel Line of the Fourth Diversion Expressway will add much-needed transportation capacity to a growing municipality. Chongqing is a mountainous city bisected by the Yangtze River, and river crossings and mountains make up much of the 28-kilometer-long (17.4-mile-long) project. The project also includes seven interchanges—one of which intersects eight roads and contains 35 ramps. From start to finish, the project team relied on BIM (Building Information Modeling) tools in the Architecture, Engineering & Construction Collection—including Civil 3D engineering-design software, Navisworks project-review software, InfraWorks infrastructure-design software, and Revit building-design software—to help integrate workflows during the planning and design of the complex project.

Huangjueping Yangtze River bridge - Image courtesy of Chongqing Municipal Research Institute of Design

THROUGH MOUNTAINS AND ACROSS RIVERS

Chongqing Municipal Research Institute of Design used a large, multidisciplinary team to deliver the Parallel Line of the Fourth Diversion Expressway design. The total costs were expected to exceed $4 billion, so the team was determined to optimize every aspect of the high-profile project. It was especially committed to making the expressway user friendly while harmonizing with the surrounding urban environment and existing infrastructure.

The team needed a way to capture and share existing conditions as it designed the many aspects of the project, bringing together existing maps of infrastructure and aerial imagery of the city. Just as important, the team wanted a way to see the high-level design and engineering implications of its design options.

GAINING AN INTEGRATED VIEW

The team decided to use a combination of BIM tools to help plan the overall project. It turned to drones to gather aerial imagery of the area and to GIS (geographic information system) data for maps of existing infrastructure. Bringing that into InfraWorks gave the team a 3D view of existing conditions. With a combination of Civil 3D and Revit, it designed and engineered concepts of the new expressway. The team could then bring this design information into InfraWorks and blend it with the existing conditions model.

Dynamo, a computational-design tool that integrates with BIM design applications such as Revit, let team members use programmatic rules to refine the expressway. This approach helped the team explore multiple design options in just a few days—something that could have easily taken months, considering the length and complexity of the expressway.

Xiaoyang Zhang, professorate senior engineer on the project, explains: "The combination of drones for aerial photography and BIM tools—including Revit, InfraWorks, Dynamo, and Civil 3D—helped us complete map data acquisition and the initial planning faster. It took only five to seven days, and the scheme is better and the environmental impact is smaller."

SIMULATION IMPROVES DRIVING CONDITIONS

The Huayan Interchange segment of the project proved to be one of the most complex to plan and design. Intersecting eight roads and containing 35 ramps, the interchange had the potential to confuse drivers. Drawing the complex web of ramps—even in 3D with Revit, Civil 3D, and InfraWorks—could provide only limited insight into how a driver would navigate the ramps. The team turned to BIM-compatible virtual-reality (VR) technology to simulate the driving experience. It brought design models created with Civil 3D and Revit into VR tools to explore the best way to configure the ramps.

"In the interchange design, by combining design models created in Civil 3D and Revit with VR technologies, we made the interchange better for driving," Zhang says. "We could experience the line of sight in the driving process. The simulation results were used to guide the optimization of the design. It would have taken six months to design with the traditional design method. But with BIM, it took us about three months."

BRINGING TOGETHER INSIGHTS FROM 20 DISCIPLINES

The project team points to its multidisciplinary approach and the BIM tools in the AEC Collection as keys to the speed and success of the design. It estimates that the close collaboration enabled by using compatible tools—such as InfraWorks, Revit, and Civil 3D—helped shorten the design time on the project by 15%. With the team easily able to incorporate the input from more than 20 disciplines—including specialists in roads, bridges, tunnels, architecture, transportation, and more—it was able to make better decisions and gain an overall view on a project that generated more than 5,300 files.

Huayan interchange - Image courtesy of Chongqing Municipal Research Institute of Design

BUILDING DESIGN

With the reality of population growth, never before has the building industry faced such demand. The need for buildings globally—whether it's housing, community projects, or skyscrapers—is outpacing what can often be delivered. At the same time, we also face dwindling resources and the need for more and more energy efficiency. We can only expect more of the same challenges. That means it's time to do more with less.

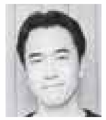
The way we build is making the definitive shift to a collaborative, end-to-end workflow with stakeholders involved from start to finish, eliminating clashes and rework. Speed of design and construction is also becoming paramount with shifts to modular approaches. At the same time, sustainability is at the forefront to save resources. Throughout the project lifecycle, BIM brings all teams together, enabling newfound efficiencies.

Here, we celebrate the AEC Excellence Awards 2018 Building winners who are demonstrating the opportunity to push the industry to new heights and meet today's challenges.

JUDGES

LUKE FAULKNER
Director of Technology Integration
American Institute of Steel Construction

LIANG JIN
Software School BIM Project Team Director
Tsinghua University



MASATOYO OGASAWARA
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XAVIER FODOR
Editor in Chief
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DONNA LAQUIDARA-CARR
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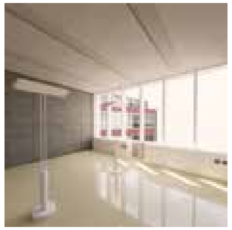
Dodge Data & Analytics



SMALL PROJECT

OFFICE BUILDING EXTENSION eGHA

Basler & Hofmann AG

MEDIUM PROJECT

BROWN UNIVERSITY, ENGINEERING RESEARCH CENTER

KieranTimberlake, BuroHappold Engineering, Shawmut Construction

LARGE PROJECT

STAVANGER UNIVERSITY HOSPITAL - SUS 2023

Nordic–Office of Architecture / COWI

BUILDING DESIGN

small project

(less than $20 Million)

Project:
Office Building Extension eGHA

Firm:
Basler & Hofmann AG

Owner:
Basler & Hofmann AG

Location:
Zurich, Switzerland

Software:
Autodesk® AEC Collection
Autodesk® BIM 360®

> *With everyone collaborating on the same intelligent Revit model, we've been able to improve building quality even as we solicit input from every stakeholder. We gained visibility into every aspect of the design—something that wasn't possible with previous solutions*
>
> *– Mathias Kuhn, Structural Engineer, Basler & Hofmann AG*

BASLER & HOFMANN AG MOVES TO A 3D MODEL AND GOES PAPER-FREE FOR OFFICE ADDITION

Connected BIM approach helps drive collaboration and building quality

Basler & Hofmann AG decided to expand its Esslingen, Switzerland office to include a three-story addition featuring a new cafeteria and canteen plus 350 square meters (3,767 square feet) of office space. But there's more to this expansion than meets the eye. It has notable features, including photovoltaic (PV) cells on the roof and facade. More importantly, the project is one of the few in Switzerland to fully embrace BIM (Building Information Modeling) for the full lifecycle and represents a revolution in the company's approach to design, planning, and delivery.

While Basler & Hofmann AG began using BIM in limited circumstances several years ago, for this project, the company wanted to take full advantage of BIM's capabilities, implementing Revit building-design software, Navisworks project-review software, and BIM 360 cloud-based project management software. Instead of having the different stakeholders work from separate 2D plans, the firm sought to have everyone—including architects; structural and mechanical, electrical, and plumbing (MEP) engineers; and construction contractors—work from a single BIM model. And instead of using printed drawings, the firm preferred a paper-free project with no 2D drawings—even during construction.

CLOUD-ENABLED PROJECT DELIVERY MAKES DESIGN AND PLANNING COLLABORATION EASIER

During the design and planning phase, the team used a single Revit model approach, giving stakeholders full, real-time visibility into all design aspects and helping them understand conflicts and dependencies, which led to a high BIM level of development (LOD) of between 300 and 400. The structural engineering team—which would typically deliver reinforcement and general arrangement (GA) drawings—was able to present designs in a complete 3D model including the reinforcement for the contractor, while the MEP team was able to contribute a highly accurate MEP model.

Structural rebar - Image courtesy of Basler & Hofmann AG

Architecture (Northeast) - Image courtesy of Basler & Hofmann AG

The intelligent model enabled a high degree of clash detection and more structured issue management, which were of great value given the density of building elements in the model. The contractor used the Revit model to design the formwork and deliver bar schedules to fabricators. And the use of intelligent models has improved productivity in coordination meetings between architects, engineers, and contractors.

BRINGING THE BIM MODEL TO THE FIELD

Relying on the BIM model as the single source of truth didn't stop after the design phase. Thanks to BIM 360, Basler & Hofmann AG was able to bring the complete, live 3D model directly to the jobsite, where it can be consulted in real time using tablets. As a result, document version control has not been an issue at any point in the project lifecycle. In addition, the firm was able to completely eliminate use of paper and disconnected data at the jobsite.

Thanks to the high LOD of the Revit model, construction has been remarkably smooth to date. As of this story, construction is halfway complete and is a rousing success, both in terms of building quality and stakeholder satisfaction. After this experience, the jobsite foreman affirms that he doesn't want to ever work on a traditional construction site without the benefits of BIM.

MOVING FORWARD WITH A NEW APPRECIATION FOR BIM

While at times it has been challenging for stakeholders to change the way they've always done their jobs, this project has convinced Basler & Hofmann AG of the necessity of embracing BIM. In the process, the teams involved have learned the ins and outs of BIM while adapting to new ways of doing things.

In addition, the benefits of using a cloud-enabled BIM approach have continued beyond the construction site. When Basler & Hofmann AG posted the intelligent model of the project on its intranet, people across the company expressed appreciation for the opportunity to better understand the building where they work.

Image courtesy of Basler & Hofmann AG

BUILDING DESIGN

medium project

($20 Million - $200 Million)

Project:
Brown University, Engineering Research Center

Firm:
Architect: KieranTimberlake
Engineer: BuroHappold Engineering
Contractor: Shawmut Construction

Owner:
Brown University

Location:
Rhode Island, USA

Software:
Autodesk® AEC Collection
Autodesk® BIM 360®

> *"With robust, cloud-based BIM, everyone could see behind the curtain and understand what everyone else was doing. The construction manager could better understand why the architects did what they did, the architects understood exactly what the MEP engineers were contributing, and so on. Everyone was on the same page, and there were no surprises."*
>
> *– Paul McGilly, Associate Principal/BIM Manager, BuroHappold Engineering*

NEW RESEARCH CENTER AT BROWN UNIVERSITY DEMONSTRATES THE POWER OF IPD AND BIM

KieranTimberlake and BuroHappold Engineering use BIM 360 to simplify design, planning, and construction across an integrated project team

To give students the hands-on experience they need to succeed in the 21st century, Brown University commissioned a new Engineering Research Center in 2014. Completed in 2017, the 80,000-square-foot building features labs, clean rooms, an imaging suite, and flexible shared workspaces. The project, led by KieranTimberlake architects, BuroHappold Engineering, and Shawmut Design and Construction, was one of the first institutional labs in the country delivered using the integrated project delivery (IPD) model, in which the client, architect, engineers, and contractor are all responsible for project development, stakeholder engagement, and project management aimed at an on-time, on-budget project.

Several factors made the project especially challenging. With key designers and consultants dispersed across the United States—from Seattle and San Diego to Philadelphia, New York, Boston, and Providence—effective, efficient collaboration was key. In addition, the IPD team employed target value design (TVD) principles to manage the project to a fixed budget while delivering a building that meets higher-than-usual standards. Finally, because systems for hazardous exhaust and specialty gas require special piping systems, the building needed denser-than-usual ceiling cavities. This necessitated constant coordination between designers and trade partners to avoid clashes and ensure that systems routing met the project's high design and performance aspirations.

USING CONNECTED BIM TO DRIVE INTEGRATED PROJECT DELIVERY

From the earliest stages of the Engineering Research Center project, the project team took a cloud-enabled, connected BIM (Building Information Modeling) approach to drive close collaboration between architects, engineers, the construction manager, trade partners, and Brown University faculty members. Faculty and design-team leaders knew they wanted to be able to confidently use the intelligent model during regularly convened dual-committee meetings—one focused on design and planning and another on lab development. By using connected BIM as the framework for delivering the project, team members had a way to achieve their collaboration goals and create a single source of truth for design and construction information. Project management and collaboration were simplified, all stakeholders remained on the same page, there were no surprise issues, and the project met Brown University's requirements.

Using BIM 360 collaboration and project-management software, the design team was able to share model updates across disciplines in real time, enabling extensive iteration, improved coordination, and immediate clash reconciliation—from design and planning through construction and assembly. BIM 360 also offered real-time cost tracking and reporting, letting stakeholders make design decisions based on project budget while helping optimize construction sequencing.

During construction, stakeholders in the field used BIM 360 to access the intelligent model via mobile devices, which helped simplify construction management, easily identify emerging issues, and filter critical issues by location, stakeholder responsibility, and scheduling impact.

SIMPLIFYING PROCESSES AND LOWERING COSTS WITH BIM AND IPD

Understanding space and its management was key to ensuring that the building's complex lab infrastructure, including pipe and duct systems, were fully coordinated with the architectural and structural design. Using BIM 360 and Revit building design software, designers conducted virtual walk-throughs with trade partners, simplifying the process of issue communication and resolution. Upon receiving clash reports from the field, designers and trade partners were able to highlight issues in the model, make changes in partnership with architects and engineers, and share the changes with the construction manager in real time.

Designers worked closely with trade partners to develop a single, cohesive, intelligent model that was accessible to all stakeholders. There was no need to generate separate models for fabrication because fabrication models were already part of the model. BIM 360 let the mechanical-piping contractor collaborate with the mechanical engineer right inside the Revit model, making the transition from design to fabrication easy.

Shared Revit models also acted as the foundation for performance and energy-modeling efforts, supporting energy-model runs, daylighting analysis, and studies in incident solar radiation and heat gain. Additionally, live scheduling and area takeoffs in BIM 360 let the team track and produce documentation for LEED credits, while enabling a fabrication process that minimized materials and costs.

BENEFITING FROM CONNECTED BIM ACROSS THE PROJECT—AND THE BUILDING—LIFECYCLE

The Engineering Research Center was completed several months ahead of schedule, providing Brown University with an estimated $10–$15 million in added value compared to traditional processes. Performance-wise, the Engineering Research Center's energy efficiency is 25% above the standard for its building type, earning it a LEED Gold rating.

The connected BIM approach also made a huge difference in work-life balance for the engineers on the project, shortening their schedules by 20%, which allowed them to work regular 40-hour workweeks. That compared to the 50 or 60 hours they'd typically spend on similar projects—all while helping eliminate errors and improving design quality. In the field, the mobility provided with BIM 360 saved time and effort for all stakeholders, supporting a dramatic reduction in punch-list items during construction.

Now, with construction complete, Brown University will use the BIM model to optimize operations and maintenance.

The Engineering Research Center unites a previously disconnected assembly of buildings into a new home and community resource for Brown University School of Engineering. - Image courtesy of Peter Aaron/OTTO

BUILDING DESIGN
large project
(over $200 Million)

Project:
Stavanger University Hospital
SUS 2023

Firm:
Nordic—Office of Architecture / COWI

Owner:
Helse Stavanger

Location:
Rogaland, Norway

Software:
Autodesk® AEC Collection
Autodesk® BIM 360®

> *The Stavanger University Hospital project highlights the value of using BIM from design to planning and construction, and shows how BIM enables a modular approach resulting in the delivery of high-quality buildings on time and under budget.*
>
> *– Johannes Eggen, Principal Partner, Nordic—Office of Architecture*

MODULAR DESIGN WITH BIM DRIVES MASSIVE EXPANSION OF HOSPITAL

Nordic—Office of Architecture and COWI use Design for Manufacture and Assembly approach to construction

An expansion of Norway's Stavanger University Hospital, scheduled to open in 2023, posed unique challenges for the firm Nordic—Office of Architecture. With 650 patient rooms and 100,000 square meters (more than 1 million square feet) of floor space enclosed in four buildings connected by a ring of glass bridges, the project's size alone posed its own challenges. To aid with inpatient recovery, design requirements included an emphasis on using natural light and on establishing the building's connection to nature.

The hospital also wanted a high degree of standardization in building elements to enable flexibility, patient safety, and adaptability. Finally, the project team—comprising two architecture firms, two structural-engineering firms, MEP teams, and specialist consultants for fire and acoustic—were spread across Norway, so efficient communication and collaboration was essential.

To build the project on time, on budget, and to the hospital's design requirements, Nordic, working in collaboration with COWI consulting group, needed to take a more modular approach to design and construction. Specific project goals included eliminating workflow redundancies and incorporating automation; improving collaboration and information sharing across disciplines; and ensuring an information-rich, modularized approach across the project lifecycle. To simplify workflows and keep the large project team in sync, Nordic needed the right digital collaboration and modeling tools. Nordic also adopted a Design for Manufacture and Assembly (DFMA) approach to the project, reducing the time needed to design building modules and identify and resolve design clashes.

USING BIM ACROSS THE BOARD

Nordic embraced BIM (Building Information Modeling) to meet the project's goals. While Nordic uses BIM in every project and at every scale, for the Stavanger University Hospital project, it has taken a new, cross-disciplinary approach, with at least one BIM-savvy member per discipline on teams responsible for various building elements. Its MEP engineers developed a Dynamo Studio script with an interface for a "coordination tool" that let them carefully control both design duplication and prefabrication, right within the overall project environment. In addition, the team used BIM 360 to communicate and coordinate for module placement and parameters.

In the early phases of the project, stakeholders relied on a 3D model and cloud rendering from Autodesk software—including Revit building design software—for daily team meetings, project management, and design work. The ability to view and collaborate in the Revit model has improved communication and collaboration, data management, and cross-disciplinary workflows. Area and room layout, furniture, and functional information can be edited right in the intelligent model. Using virtual reality, the hospital can do extensive virtual walkthroughs of the model.

BIM has also enabled wind analysis to prevent wind-tunnel effects in the finished project's central courtyard, as well as daylight and shade analysis to ensure the inclusion of the right types of glass in the facade. In the current project stage, Nordic is using tools such as a Dynamo Studio-scripted coordination tool and BIM 360 to gain visibility into, streamline, and ensure the quality of construction sequencing, including the delivery schedule of modules fabricated off-site.

DFMA APPROACH HELPS WITH MODULE PREFABRICATION

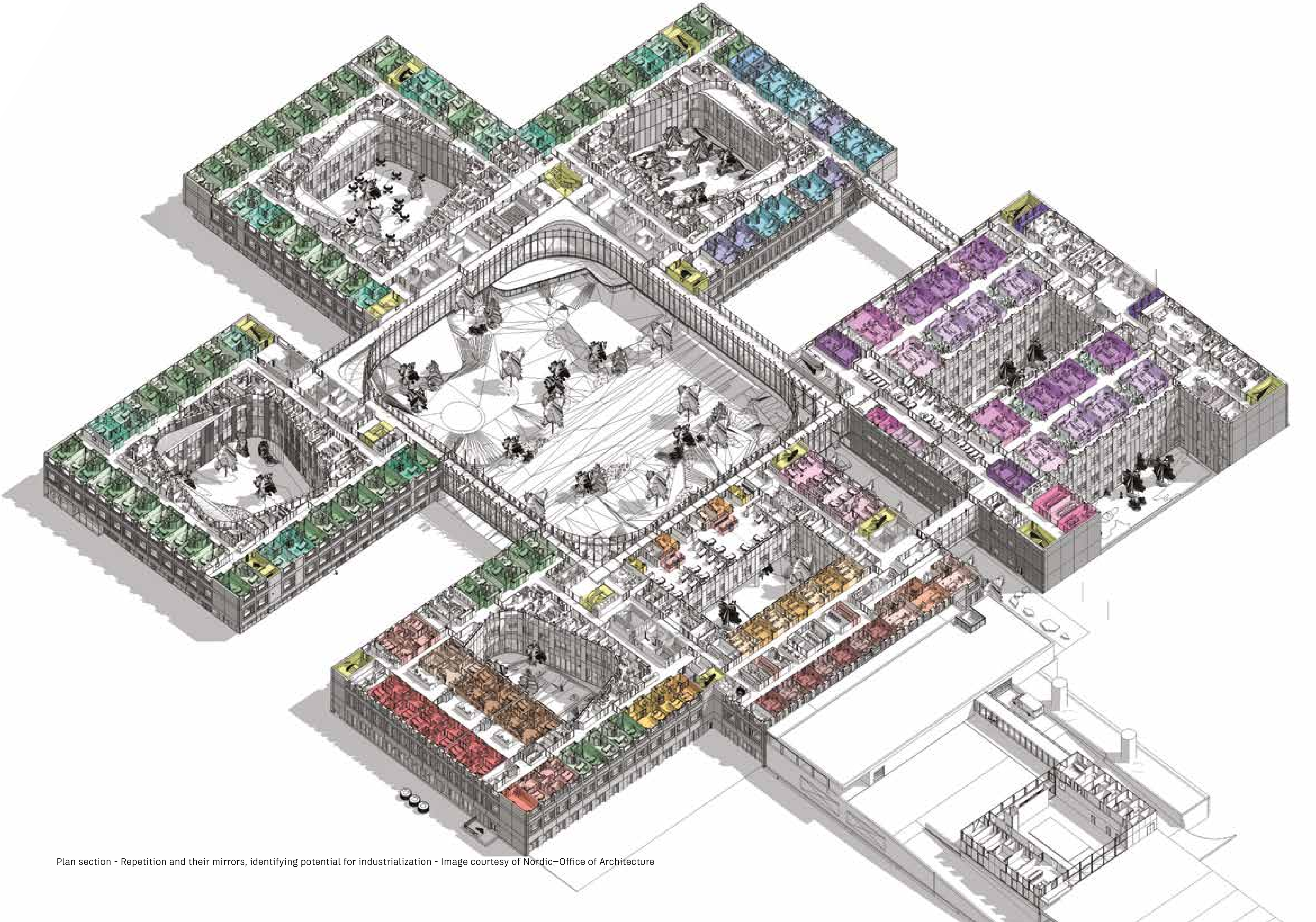
Nordic's approach has enabled an exemplary level of quality-assured modularization using BIM. Cross-disciplinary teams collaborate on modules, and the intelligent volumetric "placeholder" model with the use of the coordination tool automatically places module parameters and allows the calculation of module quantities. Module placement, cross-discipline design analysis, and quality control are automatic, and the design team no longer has to make drawings for the construction team and fabricators. Instead, the team can deliver all the information needed to price and fabricate modules and complete construction right in the intelligent model.

The DFMA approach has resulted in immense benefits. For instance, the engineering team could place fixtures and devices for a whole floor in just days instead of weeks. It also gave facade architects the ability to control a complex, nested family of facade-panel parts. They could easily swap in and out facade panels made of multiple materials—capturing each design iteration while meeting required parameters such as glass types, panel sizes, and window inclusion and color. Among the results: Facade architects have been able to include approximately 50,000 square meters (more than 500,000 square feet) of prefabricated facade in their design.

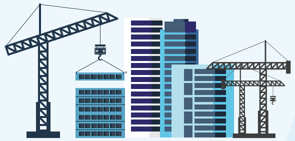
OPTIMIZING DESIGN AND BUILDING—TODAY AND TOMORROW

By using BIM to drive a DFMA approach, Nordic was able to focus its efforts and spend more time designing high-quality modules and less time coordinating, controlling, and modeling vast amounts of repeating geometry. The team could also simplify the identification and resolution of design clashes. Moving forward, the project's focus on prefabricated modules will result in efficient construction on site, less material waste, and reduction in the amount of costly errors on site due to the off-site production of fully completed modules. And while much of the time savings on this project has been filled with extra effort to get up to speed on its modular, BIM-driven approach, Nordic and COWI expect similar time savings on future projects using this approach.

Finally, on this project, Nordic is currently testing a cloud-based tool, designed by Project Frog—a provider of integrated project platforms—in collaboration with Autodesk, which will provide an online library of parts and module configurations. Nordic expects that the tool will further minimize waste on-site.



Plan section - Repetition and their mirrors, identifying potential for industrialization - Image courtesy of Nordic—Office of Architecture



CONSTRUCTION

Cost, time, and safety concerns have always been the enemies of the construction industry. But now those challenges have become even more critical as the demand for construction has risen dramatically. And there are new problems to face with less skilled labor and the fundamental need to reduce waste even further. We simply can't do more of the same.

With BIM, construction can make a fundamental shift in how we build with informed decision-making throughout a project. Coordination and collaboration between contractors and design teams begin much earlier with preconstruction and before a shovel ever reaches the site. The way we build is also transforming with industrialized construction and automation that deliver newfound efficiencies and resource savings.

And, most importantly, injuries are reduced, and lives saved with the applications of BIM. These AEC Excellence Award 2018 Construction winners demonstrate how we can take a new view at how construction is approached and see the dramatic, positive results when applied.

JUDGES

ZULFIKAR ADAMU
Associate Professor of Strategic IT in Construction
London South Bank University

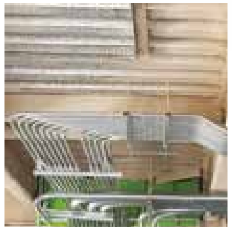
ADA FUNG
Chairperson
Committee on BIM of Construction Industry Council of Hong Kong

ZHANG LIWEI
Deputy Director
Bureau of Public Works of Shenzhen Municipality of China

AILEEN CHO
Senior Editor
Engineering News-Record

RYOTA IEIRI
BIM & Construction ICT Journalist
Ieiri Lab., Ltd.

JEONG WOO
Professor and Program Director of Construction Management
Milwaukee School of Engineering



SMALL PROJECT

BAPTIST HEALTH MD ANDERSON CANCER CENTER

Miller Electric Company

MEDIUM PROJECT

THE UNIVERSITY OF VIRGINIA (UVA) HEALTH SYSTEM UNIVERSITY HOSPITAL EXPANSION

Skanska USA

LARGE PROJECT

CLONEE FACEBOOK DATA CENTRE

Mace Group

CONSTRUCTION

small project

(less than $100 Million)

Project:
Baptist Health MD Anderson Cancer Center

Firm:
Miller Electric Company

Owner:
Baptist Health

Location:
Florida, USA

Software:
Autodesk® AEC Collection
Autodesk® BIM 360®
Autodesk® Point Layout

> *We asked ourselves how we could get the most out of our workflow. It's about creating a workflow that makes sense for us and all our trade partners. We were able to achieve a 100% success rate with our prefabrication and installation process. That's because the information—the data—behind the process was so accurate.*
>
> *– Alan Creel,*
> *Vice President of Preconstruction Services,*
> *Miller Electric Company*

HURRICANE-PROOF PLANNING

BIM keeps construction plans out of the eye of the storm

Serving the health needs of Jacksonville, Florida, the Baptist Health Serving the health needs of Jacksonville, Florida, the Baptist Health MD Anderson Cancer Center (Baptist MD Anderson) brings dedicated cancer care to North Florida. The new nine-story, 600,000-square-foot project opened on time in September 2018. At the height of the construction process, in September 2017, the construction team confronted a potential schedule buster that's difficult to anticipate in even the best preconstruction planning—a hurricane. As Hurricane Irma headed toward Florida, Miller Electric, the electric contractor on the project, looked at precise BIM (Building Information Modeling) plans for the project and rapidly changed them to account for the coming weather onslaught.

WINNING WORK AND DELIVERING EXCELLENCE WITH BIM

Baptist MD Anderson is located in downtown Jacksonville. It sits next to an interstate highway and busy surface streets, with a river just a block away. The site offered little room to stage and store construction materials for any trade. Miller Electric won the job by going beyond proving that its team could wire the building and support the installation of the advanced medical equipment. It took the unusual step of showing how it would use BIM tools for modeling, fabricating, and installing electrical assemblies.

"Many complex jobs require the use of BIM these days," says Alan Creel, vice president of preconstruction services for Miller Electric. "But there can be the expectation that BIM is mostly for coordination or clash detection. We use a process that links models to fabrication and the schedule. It's like we build the project virtually before the first shovel ever hits the ground. We demonstrated how we could fabricate off-site and install on-site without requiring a storage area. Our approach was perfect for the job, and Miller Electric won the work."

PLANNING TAKES A WEATHER DETOUR

As the project advanced, Miller Electric used Revit BIM software and a supplier's Revit-based plug-in to create fabrication models from the design models. Due to a lack of material storage space on-site, the team relied on BIM 360 for cloud-based coordination of delivery of materials to the site. A few miles away in the Miller Electric shop, the fabrication team built entire sections of electrical work and loaded it onto trucks for immediate installation. Then the weather forecast changed everything.

Hurricane Irma, 2017's second most powerful storm, formed in the Atlantic, and forecasters warned that it would impact northern Florida. The Miller Electric team quickly modified its plans. It used Navisworks and BIM 360 planning tools to accelerate the fabrication, delivery, and installation of some materials. The idea was to get key pieces installed prior to securing the construction site. Juggling the schedule, the team moved back delivery of other portions of the project.

"We were able to adjust our schedule and all the many dependencies quickly," Creel says. "We adjusted sequencing for areas we'd already modeled to account for the changes. Collaborating in the cloud helped us communicate with the whole team. When Irma flooded much of downtown Jacksonville, we were ready to stop work and start again without missing a step."

OFF-SITE FABRICATION SUPPORTS SUSTAINABILITY

Electrical conduit is more flexible than ductwork, plumbing, and other building systems. Traditionally, that has meant that electrical contractors install their work during later stages in the process. They're expected to physically work around coordination issues and potential conflicts. In such situations, conduit can take indirect routes around other items installed in walls and ceilings. This takes time and requires plenty of conduit to go around obstacles, and the excess material cuts lead to landfill waste.

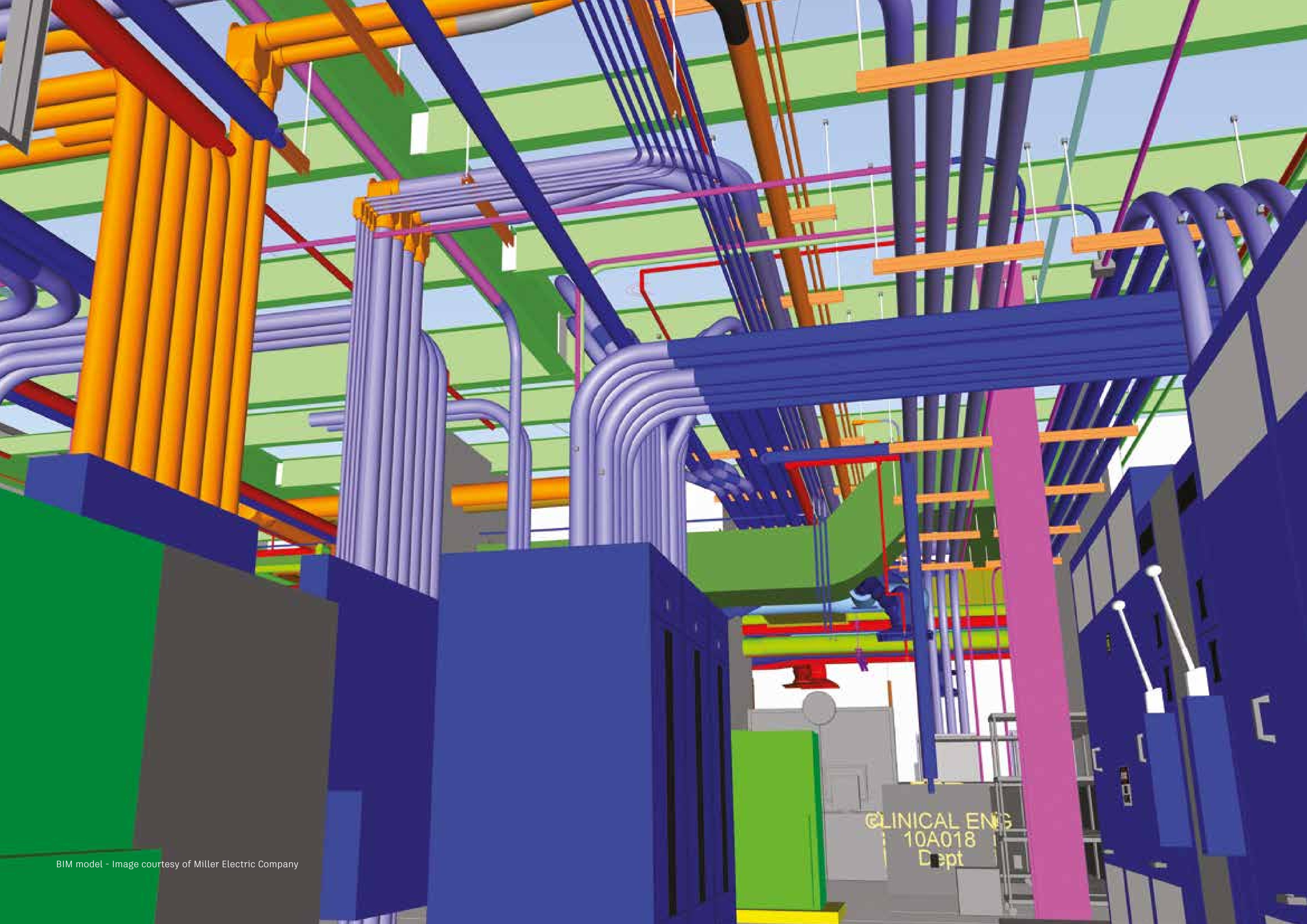
Miller Electric uses off-site prefabrication to address this issue. First, the team used BIM 360 to coordinate and eliminate conflicts with contractors and other trades. Then, off-site, Miller Electric fabricates large assemblies of electrical work from models and installs that work before the other trades do—producing less waste and packaging.

Models guide installation, too. Miller Electric uses models to determine installation points in Point Layout software. The firm exports this information into robotic survey instruments and uses lasers to mark exact locations for work. The traditional approach requires hours spent tape measuring—and results in occasional disagreements with other trades about which measurements are correct.

Prefabrication installation - Image courtesy of Miller Electric Company

SHOP-TO-SITE CONTROL AND CONFIDENCE

The Baptist MD Anderson project is an example of how Miller Electric used technology to avoid weather setbacks, save time, and support sustainability. The precision of the off-site fabrication proved to be perfect, with 100% of the modules fitting as planned.



BIM model - Image courtesy of Miller Electric Company

CONSTRUCTION
medium project
($100 Million - $500 Million)

Project:
The University of Virginia (UVA) Health System University Hospital Expansion

Firm:
Skanska USA

Owner:
University of Virginia Health System

Location:
Virginia, USA

Software:
Autodesk® ReCap™
Autodesk® Navisworks® Manage
Autodesk® Revit®
Autodesk® BIM 360®

> *"The biggest win with a connected BIM approach is communication. The clarity and intelligence of the process brings people together. It's easier for people to see and discuss what needs to be done and improved. On the UVA project, we were able to fast-track key portions of the project with help from cloud-based Autodesk BIM 360 tools.*
>
> *– John Calvin, Project Executive, Skanska USA"*

BIM KEEPS CRANES GOING AND HELIPAD OPEN

Model-based collaboration helps hospital safely operate helipad just 30 feet from construction cranes

The University of Virginia (UVA) Health System University Hospital Expansion will add 440,000 square feet of space to the most advanced medical facility in the western part of Virginia. With one of the region's few trauma centers, UVA hospital receives as many as 20 patients via helicopter each day. The expansion brings much-needed capacity to in-patient and emergency services, but hospital operations must also continue as usual throughout construction. The construction manager, Skanska USA, and design team, Perkins+Will, used 3D construction models linked to schedules to deliver the project safely and to keep the hospital's helipad—located just 30 feet from construction cranes—in normal operation for 22 months.

Southwest rendering of the exterior skin and cantilevered portion of the hospital patient tower - Image courtesy of Perkins+Will Architects, Skanska USA

SAFETY: A TOP PRIORITY ON THE GROUND AND IN THE AIR

UVA chose Skanska USA for the project because of the firm's commitment to safety and its use of model-based collaboration to coordinate with the design team during design and preconstruction. For instance, Skanska USA was an early adopter of construction techniques and planning that nearly eliminates the use of ladders, which are at the root of many construction injuries.

Skanska USA made safety the project's guiding principle, but it had to ensure that this project accounted for the safety of more than just construction workers and construction-site visitors. The team had to plan for the safety of—and ready access for—faculty members, hospital staff, ambulances, and patients. Plus, the team had to ensure that the UVA's Level 1 Trauma Life Flight team always had a safe path to land and take off—even with cranes working close to the helipad.

"We used BIM [Building Information Modeling] tools—including Revit building-design software, Navisworks project-review software, and BIM 360 cloud services—to model and plan construction," says John Calvin, project executive for Skanska USA's building operations in Virginia. "For instance, Navisworks helped us sequence and plan construction to minimize the impact to hospital operations. We were also able to go to the executive team and show them 3D sequences of how we planned to deliver the project. Using those same types of 3D Navisworks models, we worked with the helicopter pilots to develop a plan to keep them safe. They could see the landing pad in relation to the cranes before encountering them in a landing or takeoff situation."

BIM IN PRECONSTRUCTION ACCELERATES SCHEDULE

From the early project stages, Skanska USA, UVA, and the design team collaborated to coordinate the project and avoid constructability issues. BIM 360, Revit, and Navisworks were central to this effort, with stakeholders using aggregated, cloud-based models to spot and eliminate clashes before construction. They even pushed design models to the Revit Live architectural visualization service to use virtual reality (VR) to help medical teams see and improve equipment placement.

The team spotted several opportunities to reduce project cost during preconstruction. For example, the team took laser scans of the existing building processed with ReCap reality capture software and blended them with the Revit design models. This helped the team eliminate a new shaft that was going to be placed near an existing shaft. The combined ReCap and Revit model showed that the existing shaft could handle the increased load, saving $200,000.

CONSTRUCTION MODELS STAY CLOSE WITH TABLETS

Using a connected-BIM approach to share 4D project schedules, Skanska USA took the insights gained during preconstruction onto the jobsite with BIM 360. Many of the tradespeople working in the field accessed construction models with on-site tablets. They could see the schedule, communicate issues, and visualize the next steps without having to go to a construction office. Using BIM 360 to analyze crane operations, the team was able to maximize crane picks, radius, weight, and sequencing for efficiency. The similar study helped sequence steel and concrete construction to eliminate more than $1 million in bracing costs.

"Today, tradespeople are as likely to have a tablet on the jobsite as they are to have a hammer," says Cody Holder, Skanska USA senior project engineer. "It's something you can take advantage of by using BIM 360 for coordination, scheduling, and more. They access the latest information in the cloud instead of accessing potentially outdated models. Tablets and BIM 360 connect people who spend most of their time in the field to BIM."

CHECKING THE SAFETY BOX EVERY DAY

The construction team focused on planning for safety as part of its preconstruction modeling. How is the team doing? With more than 1.3 million hours logged on construction, the team has lost zero days due to incidents. In a single day, as many as 20 Level 1 Trauma Flights land safely. Perhaps most impressively, the Skanska USA team estimates that heavy BIM preconstruction project analysis and planning will cut the project schedule by as much as months to years as compared to a traditional process that doesn't involve early construction team involvement.

Southeast rendering of the green roof and exterior skin. - Image courtesy of Perkins+Will Architects

CONSTRUCTION

large project
(over $500 Million)

Project:
Clonee Facebook Data Centre

Firm:
Mace Group

Owner:
Facebook

Location:
Clonee, Ireland

Software:
Autodesk® AEC Collection
Autodesk® BIM 360®

> *You can have the best technology, but it doesn't really do much good unless you have backing from the whole team. We had that on the Clonee Data Centre project for Facebook. From the client to the trades, everyone on the project bought into the use of BIM and cloud technology. Now, it's hard to imagine doing a project like this any other way.*
>
> *– Paddy Ryan, BIM Lead, Mace*

MACE USES CLOUD-BASED CONSTRUCTION MANAGEMENT FOR NEW FACEBOOK DATA CENTER

Integrated BIM tools help keep project on track

There's much to like about Facebook's new Clonee Data Centre in Clonee, Ireland. Supported by 100% wind energy, the Clonee Data Centre is a complex that includes a pair of 25,000-square-meter (approximately 269,000 square feet) data halls designed to bring Facebook apps and services to people around the world. As many as 1,500 people per day contributed to the construction of these centers, with project general contractor Mace Technology Ireland leading the construction phase of the undertaking. To keep the project on track, Mace and the extended project team relied on the BIM 360 cloud-based platform for construction management and the integrated BIM (Building Information Modeling) tools in the Architecture, Engineering & Construction Collection.

"We orchestrated the whole project in BIM 360 with schedules linked to models," says Paddy Ryan, program BIM lead for Mace. "During construction, we validated activities as they happened. It's important to not just have a solid plan, but also to validate progress against it. Delays, defects, and surprises are less likely when you align what's happening in the field–as it happens–to what's in the plan."

COLLABORATING ON PRECONSTRUCTION IN THE CLOUD

After completing phases one and two of the project using BIM 360 during construction, Mace decided to use BIM 360 to spearhead preconstruction coordination for phase three. This allowed for cloud-based clash detection using design models, which let the entire project team review and address issues and adopt lessons learned from previous phases.

For many on the design and construction teams, cloud-based coordination was a new experience. BIM 360 gave the team access to the design models, as well as easy-to-use construction-management tools. In order to keep momentum on digital implementation, Mace provided proactive training and online how-to videos and gave regular awards for the most active BIM 360 contributors.

With everyone coordinating and collaborating on the project together using BIM 360, the project team overcame the timing and clash issues that can hamper projects without proactive preconstruction planning for later project phases. The team documented more than 336 lessons learned from the process and incorporated them into phase three. Seeing merit in this, the team decided to implement preconstruction collaboration for future projects.

AUTOMATED MODEL AGGREGATION SAVES TIME

Mace automated the process of aggregating the design team's Revit BIM models, reducing the time spent each week on model management from 440 minutes to just 10. Because Navisworks project-review software integrates simply with BIM 360 in the cloud, design, construction, and client-side teams could collaborate in real time on up-to-date, automatically federated models and automated clash reports using slave machines from any location. This tight connection across teams helped Mace manage supply-chain performance and track progress in real time. The result was reduced RFIs, rework, and time spent in meetings.

LASER SCANS, DRONES, AND VR KEEP PROJECT ON TRACK

As construction progressed, the team managed the quality and inspection process using BIM 360 in the field. The team built websites that stored live automated data to track progress daily. It also hosted videos on how to use tablets and cloud-based checklists. The team captured, analyzed, and resolved outstanding items quicker. Virtual-reality (VR) technology gave Facebook insight into progress, with the construction team facilitating VR walk-throughs of the model before drawings were created, reducing unapproved cycles. QR codes on equipment let the team scan equipment during commissioning and track deliveries. Drones flying overhead helped the team monitor construction on the massive project site.

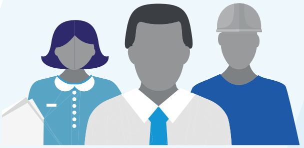
Facebook wanted accurate as-builts to help facilitate ongoing operations and maintenance of the data center. Mace turned to laser-scanning technology to create precision as-builts. Each area of the data center received multiple scans to capture an accurate model of supports, walls, building systems, and more. The team used the scans to update the Revit models, giving it the ability to resolve conflicts on-site and use BIM 360 for ongoing management of the data center after construction.

Image courtesy of Mace Technology Ireland

DELIVERING MORE, FASTER, WITH NO DEFECTS AT HANDOVER

Using cloud-based construction management on the project, Mace reports that managers saved more than 13 hours each week–helping them be 35% more productive overall. Typical site users saved 12 hours each week on document control. Organizations that participated in the quality assurance and controls processes saved more than 14 hours each week. Mace determined that employees on the construction site that were actively contributing information to BIM 360 were 21% more productive overall.

Aerial shot of Clonee site - Image courtesy of Mace Technology Ireland



INNOVATOR OF THE YEAR

We know that any project is a group of individuals and teams working together with technology to make it happen, whether it's a skyscraper, an office building, a bridge, or a home. But, with the rapid pace of innovation around the world, there are some innovators who are taking it a step further.

This year we honor an innovator who is transforming the design and construction industry in China through the use of technology, collaboration, evangelism, and innovation.

Congratulations to Zhibing Mao for being named Innovator of the Year. Here, we take a deeper look at his career and contributions to the AEC industry.

JUDGES

RUSSELL LOVERIDGE
Managing Director
Swiss National Centre of Competence in Research Digital Fabrication

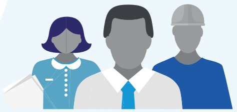
KEIICHIRO TANIGUCHI
Project Assistant Professor; Architect, Sustainable Designer
University of Tokyo

LIU ZHIMING
Vice President of China Water Conservancy and Hydropower Investigation and Design Association Entreprise

MONICA SCHNITGER
Industry Analyst
Schnitgner Corporation

ZHIBING MAO

Chief Engineer
China State Construction Engineering Corporation Ltd.



INNOVATOR OF THE YEAR

> *BIM lets everyone from engineers to building owners understand the project. While it takes time to gain BIM expertise, over the long term, doing so results in significant benefits, including improved collaboration, better project speed and quality, and the ability to build smart buildings and cities.*
>
> *– Zhibing Mao,*
> *Chief Engineer,*
> *China State Construction Engineering Corporation Ltd.*

BUILDING THE FUTURE OF DESIGN AND CONSTRUCTION WITH BIM

Renowned engineer Zhibing Mao is named this year's AEC Excellence Awards Innovator of the Year

Zhibing Mao is chief engineer at China State Construction Engineering Corporation Ltd. (CSCEC) and president of China Construction Engineering Design Group (CCEDG). One of the foremost engineers in the Chinese building industry, he has done far more than most to advance the way that projects are designed and built. A champion of BIM (Building Information Modeling) since 2009, he has relied on BIM solutions and processes to improve planning, design, and construction on a range of projects.

Mao has driven innovation on landmark projects like the Tianjin Chow Tai Fook Binhai Center (Tianjin's second-tallest building), the Tencent building in Beijing, the CCTV headquarters in Beijing, and the China Zun Tower—the tallest building in Beijing. Under his direction, the China Zun project team used BIM solutions from Autodesk to process an astounding 2.4 terabytes of reality capture data and control vertical deviation from the design by just 5 millimeters—on a building that's 528 meters tall.

DRIVING THE INDUSTRY TO COLLABORATE BETTER

Working with partners that include Zaha Hadid Architects, the Netherlands' Office for Metropolitan Architecture, and SOM USA—and working for owners that include the New Jersey Department of Transportation and Algeria's Société de Gestion des Services et Infrastructures Aéroportuaires—Mao has spearheaded the use of IT technology to improve collaboration across the planning, design, construction, and operation of projects in more than 60 countries.

In 2015 for the Silk Road International Cultural Expo project, Mao's CSCEC team collaborated with 10 design agencies, 31 contractors, and more than 100 suppliers—all told, 13,000 workers. Using BIM processes and technology, the enormous team completed a 260,000-square-meter venue and 32 kilometers of roadway in just 8 months. Without BIM, the project would have taken at least 2 additional years to complete.

SPREADING THE WORD ABOUT THE BENEFITS OF BIM

Mao is one of the world's great BIM evangelists. Research teams led by him have applied BIM for design on more than 200 projects and for construction on more than 2,800 projects. In all, he has trained some 32,000 people in the building industry on how to improve design and building with BIM.

In his role as chair of the China branch of the Chartered Institute of Building, a global industry organization, he has helped industry leaders understand the tremendous benefits that can come from adopting BIM, including simplifying the communication of design ideas, frontloading and streamlining construction workflows, and accelerating construction schedules while ensuring building quality. In this role, he drove the drafting of a national BIM technology policy for China.

He is also the chief editor of China BIM Standard, where he presided over the creation of the country's first national standard for BIM use in construction, laying the foundation for a BIM-driven future for the Chinese building industry. In addition, as a guest professor at Tsinghua University and Tongji University, he helps ensure that the next generation of builders is well versed in using BIM to drive quality, efficiency, and innovation.

SPURRING INNOVATION WITH EMERGING TECHNOLOGIES AND NEW APPROACHES

Mao is always looking for new ways to advance the building industry. He oversaw the creation of a research paper titled, "Construction Technologies for 1,000-Meter Buildings," whose findings have been applied to more than 30 skyscrapers since, including the Pingan International Financial Center in Shenzhen, China's second-tallest building at 115 stories.

In 2012, Mao piloted the use of BIM with 3D printing in China. In 2015, he delivered the world's first 3D-printed apartment building. He promotes the use of virtual reality (VR) at the construction site by setting up a VR experience booth for safety awareness and practices, which helps to save 90% of the cost for site safety training. He advised Chinese contractors in their bid for the 1,025-meter Burj Khalifa Tower in 2018.

Finally, Mao is a leading voice for using the Internet of Things at scale in civil engineering and infrastructure projects. In 2016, using a smart project-lifecycle monitoring platform developed by his team, he oversaw the safe completion of Line 9 of the Shenzhen Metro, with just 5 millimeters of variation from the model and no damage to the buildings above the construction.

Thank you to our sponsors