THE DIGITAL AIRPORT
PROJECT SHOWCASE

Extraordinary Infrastructure of the Be Inspired Awards
Bentley’s mission is to provide innovative software and services for the enterprises and professionals who design, build, and operate the world’s infrastructure — sustaining the global economy and environment for improved quality of life.

The Digital Airport Project Showcase and The Year in Infrastructure series of publications are project yearbooks published by Bentley Systems, Incorporated that showcase the extraordinary work of Bentley users sustaining the world’s infrastructure.

For information about how to enter your innovative project for consideration in the next Be Inspired Awards competition or for additional information about this program, visit www.bentley.com/beinspired.

ONLINE VERSIONS

Digital versions of Be Inspired Awards publications are available online at www.bentley.com/yearininfrastructure. Choose to view a specific issue or search within each issue using terms, titles, or keywords.

Also browse Bentley’s Be Inspired Project Portfolios at www.bentley.com/projects, which feature the winners and finalists in Bentley’s annual Be Inspired Awards competition. Through these multimedia portfolios of exemplary project achievements, Bentley shares innovative best practices with the architects, engineers, constructors, geospatial professionals, and owner-operators who sustain the world’s infrastructure.
INSPIRATION ACROSS THE DIGITAL AIRPORT LIFECYCLE

The projects presented here were each nominated for Bentley’s Be Inspired Awards, an annual global competition that recognizes outstanding achievement in the design and delivery of infrastructure. They represent tremendous innovation in the use of Bentley software and the information mobility it empowers to leverage information modeling through integrated projects for intelligent infrastructure. Intelligent, higher-performing infrastructure assets feature enhanced constructability and safety, consume less energy, and set new benchmarks in resiliency. They also often take advantage of asset lifecycle information management—as provided by, for example, Bentley’s AssetWise offerings—to facilitate change management, improve engineering information integrity and operational efficiency, and streamline business processes.

The projects in this showcase are state-of-the-art, employing Bentley solutions to collect and distribute critical facility data to all business participants across the Digital Airport lifecycle. As a central repository of land maps, civil infrastructure, building systems, and facilities management data, Bentley’s Digital Airport provides quick access to up-to-date, indexed information for security, engineering design, and facility operations, resulting in a better-managed facility by ensuring:

• Knowledge of exactly where infrastructure systems are and what role they play in the context of the facility—improving operations,
• Better information for what-if scenario planning, future capital improvement projects, and emergency response requirements,
• Consistent information for all stakeholders for better business decisions,
• Enhanced information exchange among enterprise business applications.

Digital Airport projects around the globe—including in Armenia, Australia, Azerbaijan, Canada, China, Denmark, France, Germany, Hong Kong, India, the Netherlands, New Zealand, Saudi Arabia, South Africa, the United Kingdom, and the United States—continue to demonstrate tremendous innovation in the use of Bentley’s information modeling and engineering content management software.

The professionals who design, build, and operate infrastructure strive to improve the quality of life for people around the world—and that goal is what drives the amazing projects presented in The Digital Airport Project Showcase.
Expansion Gets Off the Ground

The world’s third-busiest airport needed to grow fast. But the massive expansion plan for Dallas-Fort Worth International (DFW) got off to a slow start. Consultants were working with out-of-sync information and wasting time with collaboration delays as they shared information across disciplines and distributed teams. For the project to succeed, DFW needed effective collaboration and information exchange throughout the project team.

DFW moved to a managed environment for its AEC IT built on ProjectWise. Bringing more than 85 AEC consultants and contractors together, including firms as distant as Europe and Australia, empowered DFW to achieve success on this five-year $2.7 billion project. “This was the first project of its magnitude we had ever done,” said David Park, DFW application administrator and IT support. Launched in 2000, DFW’s capital development program included:

- The new International Terminal D, with 29 gates, an eight-level parking garage with 8,100 spaces, and a 298-room hotel. More than 50 architecture and engineering firms collaborated to design the terminal and garage.
- The SkyLink Automated People Mover light rail system, which will link six terminals, carrying 10,000 people per hour in 64 cars — the largest project of its kind in the world. Nearly five miles of track run an average of 50 feet above ground.

In 2000, DFW set up its widely dispersed project team, but sharing information across such distances quickly became a bottleneck. A long-time user of MicroStation, DFW had developed a homegrown solution to share information on site. The on-site system didn’t support remote users, however, so DFW posted project files for download from its FTP server.

“Each consultant would be working from his or her own sets of design information. We couldn’t keep it up to date—he or she could be designing on outdated information,” Park said. “We needed a system for project content management. For example, with Terminal D, we had separate teams working on the terminal, roads, hotel, and the parking garage. They needed to share information immediately.”

Putting ProjectWise To Work

A year into the project, DFW implemented ProjectWise. The result was immense productivity benefits. Park said, “It saved us from the coordination problems in sharing information, enabled real-time collaboration, and helped us better manage our CAD standards. We eliminated a lot of wasted time.”

Beyond design collaboration, DFW uses ProjectWise to archive as-built drawings and other information for lifecycle asset management and for use on future projects. ProjectWise allows users to search, query, and navigate AEC information across projects and operations. “The query comes in very handy when you need to know where a particular drawing resides—we have more than 3,000 vaults,” Park noted.

“DFW was able to execute one of the largest airport expansion projects in the world by employing ProjectWise to help manage the large scale and complexity of the project.”

DFW also uses ProjectWise to produce project-wide reports and statistics. For instance, DFW might need to know how many drawings are still in the actual construction phase and how many have gone to as-builts,” Park said. Additionally, DFW uses ProjectWise to manage access to information across its distributed project teams. As the project progresses, different groups get different access permissions.

Secure access to information became even more critical to DFW as the airport strengthened security measures under federal mandates in the wake of 2001’s terrorist attacks. This involves sensitive data on highly secure airport equipment, and DFW could not have consultants carrying information on CDs or e-mailing it. ProjectWise satisfied the high level of security required by federal agencies.

ProjectWise now supports all of DFW’s major construction projects. The airport’s IT department is standardizing on ProjectWise to manage all its documents, regardless of file format. Park concluded, “It saved us from the coordination problems in sharing information, enabled real-time collaboration, and helped us better manage our CAD standards. Through a managed environment, DFW was able to execute one of the largest airport expansion projects in the world. ProjectWise will continue to empower DFW’s successful project management and delivery.”
Greater Toronto Airports Authority
Pearson International Airport
Toronto, Canada

CASE STUDY
GIS Works Directly With Oracle Spatial
The Greater Toronto Airports Authority (GTAA) is a not-for-profit corporation with a mandate to provide the Greater Toronto Area with a regional system of airports that meets the current and future demands for air services. Toronto’s Pearson International Airport is Canada’s busiest airport, handling 31 million passengers in 2006. Established in 1939, Pearson Airport currently handles more than 1,200 arrivals and departures every day or more than 418,000 aircraft movements last year. By the year 2020, the number of travelers passing through the airport’s gates is expected to reach 50 million.

Toronto Pearson International Airport is the first airport in North America to receive certification to the ISO 14001 international environmental standard. Among their many recent undertakings is the design and construction of Terminal One’s new Pier F and a revitalized and expanded Terminal 3. When the GTAA took over responsibility for the operation of Toronto Pearson from Transport Canada in 1996, it took on major challenges. To maximize efficiency and to minimize cost, a bold plan was developed to phase the construction of a revitalized airport the size of a small city.

The GTAA Technical Data Center (TDC) is responsible for the creation and maintenance of building, site, and utility information. The team in the TDC works closely with other GTAA functional groups including Project Services, Airside Engineering, Planning and Professional Services, providing facility and site engineering staff, and external contractors with information that is accurate, up-to-date, and accessible.

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The TDC chose Oracle Spatial as its primary spatial data store. The team also utilizes ProjectWise, spatially enabled with ProjectWise Geospatial Management, and the ProjectWise Connector for Oracle to complete the data editing and data maintenance workflows. By leveraging the disconnected editing workflow made possible by the ProjectWise Connector for Oracle, the TDC staff will be able to quickly enable field editing by engineering staff responsible for creating and maintaining the building space and site infrastructure data, thus reducing errors and streamlining work processes.

Spatial and Non-spatial Analyses and Reporting
In the TDC, team members typically perform data maintenance using as-built data coming from outside contractors. Often this data is in non-standard formats and uses different specifications, making integration with core data sets cumbersome and time consuming. As a new source of information, the TDC will be able to outfit GTAA field data editors with the ability to capture information on different assets located inside buildings or outside on the site using tablet PCs loaded with a MicroStation-based GIS application built with the Bentley XML Feature Modeling (XFM) capabilities. Future workflows will see contractors provided with direct access to data relative to their construction site.

Upon completion, final as-built information will be incorporated into drawings extracted from the base data in Oracle Spatial. The very detailed design drawings of the building and site spaces will remain in DGN, DWG, TIF, or PDF form securely managed by ProjectWise, while the core feature data would be finalized and quality-controlled using Bentley GIS applications and posted using the ProjectWise Connector for Oracle as updates to the enterprise Oracle Spatial database. This database will store most of the as-built information for the site and building spaces.

Integrating the spatial information in the enterprise Oracle Spatial database allows the GTAA to perform many types of spatial and non-spatial analyses on the airport site and building space that would not otherwise be possible. The information in Oracle Spatial represents a seamless view of the airport against which virtually any query or analysis scenario can be applied. Some examples include airport statistics per type of feature, detailed reporting on leases, grass coverage, floor covering areas, aviation surfaces, and snow plowing areas.

The information in Oracle Spatial can be used with Bentley GIS applications to produce useful thematic maps and perform overlay operations such as showing which manholes, pipes, or other facilities are in particular planning areas or depicting functional space breakdowns of spaces within a facility. The Oracle Spatial repository is also the perfect source for publishing information via the Intranet site to staff that need quick access to critical infrastructure information.
Runway to Future Projects

In today’s global environment, airlines and airport operators face the challenge of finding a balance between the need for stricter airport and aircraft security and the need to maintain operational efficiencies and minimize passenger inconvenience. Airports like George Bush Intercontinental Airport in Houston, Texas, are busy working on expansion plans to accommodate the global travel community.

To continue providing the growing number of passengers using the airport with an unsurpassed level of service and to ensure that the airport remains a powerful, economic engine, the airport embarked on an ambitious airport development program. I.A. Naman + Associates was contracted to perform an upgrade to the chilled and hot water utility distribution system for all existing terminals. In the past, the firm relied on 2D design methods but soon realized that the documentation and un-intelligent designs done in 2D would not be able to detail the changes that occur in the facility or show the many constraints within the confined space.

The project required a fast-track design and construction schedule. After researching many possibilities, the firm chose AutoPLANT. I.A. Naman + Associates was contracted to perform an upgrade to the chilled and hot water utility distribution system for all existing terminals. In the past, the firm relied on 2D design methods but soon realized that the documentation and un-intelligent designs done in 2D would not be able to detail the changes that occur in the facility or show the many constraints within the confined space.

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A New Design Plan

"By modeling in AutoPLANT, we were able to save significant time on the project, which allowed us to meet the accelerated design and construction schedule," explained Bankson. “The set of documents and models that we were able to create were impressive to not only us, but also to the clients, other design team members, and contractors. Our client liked the quality, and for us quality stands out more than anything else we do.”

I.A. Naman + Associates also used AutoPLANT Explorer ID, a solution that offers collaborative communication and interactive viewing of large 3D plant models. The engineering team upgraded desktop systems to include multiple monitors. “As we were drawing, we were rendering,” explained Bankson. “As we worked, we would load the content and then review the model. AutoPLANT Explorer ID was a huge hit for the engineering team. We love the product and find it essential in all our current and future projects.” Bankson reported that the client was very pleased that he could see the work being done and what he was buying before it was built.

I.A. Naman + Associates was also impressed with the use of AutoPLANT Explorer ID in meetings with other potential clients. AutoPLANT Explorer ID allowed I.A. Naman + Associates to record fly-throughs, add artistic elements such as sound and color, and save the AVI file on CD for easy distribution. The model allows the firm to show prospects the types of work it has done in a very interactive and graphical interface. Benefits extend past the designer and on to the contractor. The mechanical contractor used the firm’s drawings to prepare the final coordination and pipe fabrication drawings. This greatly sped up the construction progress.

As the airport renovation program continues, I.A. Naman + Associates is optimistic in being involved in future expansion projects related to new terminals and renovation of the old terminals. This could mean new projects based on its original designs. Engineers feel they have a competitive advantage and are on the cutting edge within the commercial industry due to the work they can do with AutoPLANT. “We wish we would have implemented AutoPLANT earlier for use on previous projects,” said Bankson. “We are excited to learn more about AutoPLANT’s capabilities and to begin implementing it within other areas of our organization.”
Greenfield Airport Takes Flight

For L&T-RAMBOLL Consulting Engineers, designing the civil infrastructure for a new airport to be built on a greenfield would have been enough of a challenge. The challenge became a Herculean task with the client revising the scope substantially halfway through the project without extending the project commissioning date. This revision of scope came about to make the airport fit for phenomenally large increase in the traffic projection based on its client’s new traffic studies.

Located east of the Bangalore-Hyderabad National Highway (NH 7), the new airport is 37 kilometers away from Bangalore and four kilometers south of Devenhalli. This is the first greenfield airport to be developed in India through a public/private partnership. The new Bangalore International Airport will alleviate airport congestion in India’s third busiest airport, serving 7.5 million passengers each year. Under the current development plan, the new airport is designed to handle 27 aircraft per hour. It features 42 Code C aircraft stands, a terminal building, and cargo handling facilities for 300,000 tons of cargo each year.

L&T-RAMBOLL’s civil works component includes a 4,000-meter-by-45-meter runway for Code 4E aircraft (Boeing 747, Boeing 777), a parallel full-length taxiway (4,000 meter by 25 meter) designed for Code F aircraft, two rapid-exit taxiways, and other connecting taxiways. Aprons for the passenger terminal and the cargo area measure 351,300 square meters. An isolation bay takes up an additional 14,710 square meters. Major and minor service roads will connect the apron and service areas. The four-kilometer main airport access road features two rotary intersections and a grade separator. Total road length (both airside and landside) is 30 kilometers, and parking will accommodate 2,000 cars. The civil work also covers surface drainage for the entire airport.

When the traffic forecast increased in June 2005, the terminal building expanded in size, and the number of aircraft stands and passenger boarding bridges also increased. The layout of the taxiways and the terminal access roads changed to accommodate the increased traffic. Despite these changes, the client required the redesign and construction to be completed within the project’s original time frame. Once the scope was increased, the client went through another open tender process before awarding the contract to the original contractor. The design team had to carry out the tender designs, which included studies of various design options and selection of the optimal solution.

Single Terrain Model for Design Team

Two engineers used MX to generate and examine various design alternatives to minimize the earthwork quantities and one engineer handled runway, taxiway, apron, and other connecting roads. The runway had to be designed and built on challenging terrain. Fill heights along the runway were as great as 12.3 meters. The earthwork in cut was about 5 million cubic meters, and the fill was 4 million cubic meters.

“Using MX and STAAD.Pro saved around three months from the time required to create the details drawings, which helped the firm stay on track to meet its original deadlines despite significant changes to the scope of the project.”

Another challenge in airport design is locating ancillary services under the apron. These services include drainage ducts, fuel supply pipelines, fuel hydrants, and electrical lighting conduits. Designers must position these facilities accurately and get them right the first time during construction, because redoing them would be very expensive.

STAAD.Pro helped in modeling and analyzing the impacts of the complex gear configurations of new large aircraft, such as the Airbus A-380, for consideration in the design of drainage structures. L&T-RAMBOLL created a 3D model and carried out finite element analysis to predict what forces would be transmitted to the structures lying underneath.

Though the design and construction were targeted toward the initial phase of development, concept designs for future expansions were also integrated into the detailed designs. It is estimated that using MX and STAAD.Pro saved around three months from the time required to create the details drawings, which helped the firm stay on track to meet its original deadlines despite significant changes to the scope of the project.
Enterpriswide Collaboration System Manages Work Requests

Nearly 50 percent of Australia’s airline passengers travel through the Sydney Airport, which is projected to handle 20 million international travelers annually by 2024. That is double the number in 2004 when the Australian Government approved a 20-year master plan to upgrade and expand the airport infrastructure.

Opened in the 1920s and privatized in 2002, the Sydney Airport serves 43 airlines and connects to 50 international, 23 domestic, and 28 regional destinations. In 2006 and 2007 Sydney Airport Corporation Limited (SACL) ran diversified businesses that served a total of 31 million passengers and moved 634,000 tons of freight. In fact, in any given trip through its facilities, one passenger or piece of freight requires interaction with up to 40 individual organizations.

To manage the information and assets associated with this mammoth enterprise, SACL needed an integrated system that would encompass buildings and terminals, runways and tarmacs, leased properties, and utilities. The new enterprise engineering document management system enables 450 administrative, engineering, and construction professionals to track work requests, search for and retrieve project data, and reuse design information in a controlled environment.

The self-service system not only relieves the Airport Design Services (ADS) department—that managed the ProjectWise implementation in addition to its daily responsibilities for infrastructure asset management—from the burden of responding to information requests, but also provides an efficient, reliable, and scalable resource for master planning decision support.

A six-member system design team worked directly with Bentley to identify what legacy information should be brought into the integrated Bentley technology-based system. With improved access to historic information, airport authorities will be ensured that planned infrastructure improvements support the long-term mission to meet Australia’s future air transport needs while being sensitive to environmental and social impacts on the surrounding community.

SACL has already made significant progress on master plan initiatives to expand capacity while improving safety. In addition to the AUD$500 million international terminal upgrade and expansion now underway, the airport has completed AUD$40 million in improvements to the domestic terminal and opened a AUD$65 million car park to provide 3,000 covered spaces. A new AUD$90 million baggage-handling system improves passenger safety and security by providing 100 percent checked-bag screening and five of six runway end safety areas have been extended to meet new minimum length requirements.

“Being able to use GIS, engineering document management, and specific software tools such as water, wastewater, and sewer for asset management, modeling, and analysis in an integrated environment will provide significant efficiencies and cost savings.”

Used to manage engineering design workflow and document access, the engineering information system will save staff time spent providing basic information to airport staff and stakeholders while enabling ADS to fulfill current and future work requests more efficiently. “We will be able to focus on providing quality information for master planning, resulting in better analysis for management while providing a self-service environment for the enterprise,” ADS Manager Keith Pope explained. “Being able to use GIS, engineering document management, and specific software tools such as water, wastewater, and sewer for asset management, modeling, and analysis in an integrated environment will provide significant efficiencies and cost savings. We can implement the solution at our own pace and target the key areas that need improvement first.”

In 2009, the Sydney Airport is updating the existing master plan to reflect a vision for sustainable operation and development through 2029. Future improvements will not only benefit the airline passengers it serves, but also the national economy it supports. As a major employer in the region, the airport contributes AUD$16.5 billion directly and indirectly to the New South Wales gross state product—or about 2 percent of the Australian economy. That contribution will grow along with the growth in passengers over the next 20 years.
The OR Tambo International Airport, Africa’s busiest airport, is expecting passenger throughput to increase by as much as 28 percent by 2010 when the country is expecting an influx of tourists for the soccer World Cup. In preparation, this project integrated the international terminal building and the domestic terminal building into a single terminal.

The primary challenge of the conceptual design was the dual function for the atrium. The 3D geometry required in properly combining all elements placed high demands on the modeling software. The architects used MicroStation as a hub between the various peripheral software platforms, enabling the interface of various complex structural and architectural forms.

Reconfiguring Old Airport Road near central Riyadh, Saudi Arabia, to bypass the airport would be extremely difficult, so a new road is being built at a cost of 500 billion euros to carry traffic beneath the airport. It will be more than 10 kilometers long and consist of six lanes, four tunnels, one fly-over structure, and numerous bridges and engineering structures. An intelligent traffic system will help manage traffic and improve safety.

Construction of this massive undertaking had to be accomplished without interrupting the airport flight schedule. Integrating multiple engineering disciplines—including road design, geotechnical, structural, and electromechanical—was accomplished through MicroStation, Bentley Rail Track, and InRoads, which vastly reduced the time required to design and model the new road.
Buckley AFB Army Aviation Support Facility
Aurora, Colorado, United States

The Colorado Army National Guard needed to expand its campus on Buckley Air Force Base. CH2M HILL designed a functionally efficient, low-maintenance, energy-efficient helicopter operations and maintenance facility that serves as the architectural centerpiece for the Army’s expanding campus. The entire project, which includes two aircraft storage buildings and airfield improvements, totaled approximately $37 million.

CH2M HILL
Phase 1–O’Hare Modernization Program
Chicago, Illinois, United States

The $3.3 billion Phase 1 modernization program at Chicago’s O’Hare International Airport called for construction of the first new runway (9L/27R) since 1971, extension of an existing runway (10/28), and a new north airfield traffic control tower. The program required relocation of a railroad, creek, airport guard post, lighting control vaults, and high-pressure water main. Although runways can take more than 10 years to construct, this program was scheduled for completion in six years without interrupting current service.

2009 WINNER
The Federal Aviation Administration (FAA) needed to deploy a single, enterprise drawing management system that could roll forward years of legacy data and mitigate the autonomic nature of each office’s local procedures. The product had to seamlessly integrate with existing CAD software, including MicroStation and AutoCAD, and be scalable to meet the future demands of a changing organization.

ProjectWise has allowed the FAA to unite under one umbrella. It provides an environment that takes into account the workflow and data needs of 10 FAA headquarters offices, and includes many of the local nuances each office has come to rely on. All legacy data was imported into the new environment and the initiative was completed within five months. Now, all FAA engineering drawings nationwide are available to all FAA engineers from any FAA office.

The O’Hare Modernization Program includes constructing a new runway, relocating and extending existing runways, and creating a terminal and gate facility on the west side of the airport. The program will reduce delays from an average of 24 minutes per flight to less than six minutes per flight. The improvements will save air passengers and the airlines $750 million a year in reduced delays, create 195,000 jobs, and generate an additional $18 billion in economic activity annually.

Project challenges include an aggressive implementation schedule; coordination with multiple federal, state, and local agencies; and building one of the largest construction projects in the country at one of the world’s busiest airports, all without impacting existing airport operations. ProjectWise has streamlined the coordination of design information among consultants working on interdependent projects, maintained control over base data, and organized file management for projects without limiting access to project teams.

City of Chicago
O’Hare Modernization Program
Chicago, Illinois, United States

Federal Aviation Administration
Nationwide FAA Standard Engineering Drawing Management System
United States

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Dallas-Fort Worth International Airport retained Freese and Nichols to update its water and wastewater models, and analyze the capital improvement plan for possible cost savings. Energy cost analysis revealed that adding an elevated storage tank would reduce energy consumption by about 51 percent, saving an estimated $117,000 per year and justifying the cost of the tank.

Freese and Nichols used WaterGEMS and SewerGEMS to convert, develop, and calibrate the existing models. The model conversion and calibration tools made the process cost effective and yielded a model compatible with Bentley products already in use by airport engineering staff. WaterGEMS demonstrated the cost savings of the elevated storage tank, which eliminates the need for pumping during low-demand periods.

Garver’s Aviation Group helped Nashville International Airport reconstruct its oldest runway to enhance aircraft and passenger safety. Its work included the performance of analysis, geometric and pavement design, and development of construction documents for the portion of the project south of the crosswind runway. The $24 million project included the design of all new Portland cement concrete aircraft pavement, 35-foot-wide asphalt shoulders, airfield guidance signs, and runway guard lights.

Using Bentley design tools enhanced team collaboration, allowing the firm to meet the Federal Aviation Administration’s accelerated schedule, efficiently complete the design work, and meet the engineering contract budget. Garver completed 90 percent of the plans in just three weeks. Notably, 100 percent of the existing runway concrete was crushed and reused as a base course for the new runway.
Located 10 miles from New Delhi city center, Indira Gandhi International Airport is expanding from a current capacity of 25 million passengers per annum (MPPA) to an ultimate capacity of 100 MPPA. Under a concession agreement, Delhi International Airport is developing the expansion projects including rehabilitation of Runway 10/28. Halcrow Consulting India performed detailed engineering design of the $26 million rehabilitation works.

A crucial part of an operational airfield, the 4-kilometer runway connected with 15 taxiways. Vertical geometric design and pavement rehabilitation for the runway and taxiways were designed using MXROAD. Because Runway 10/28 had to be closed during construction, scheduling was critical. MXROAD helped Halcrow achieve the delivery timeline despite multiple profile design changes.

NSCBI Integrated Terminal Building, Kolkata Airport
Kolkata, India

Phase 1 expansion of the NSCBI Airport in Kolkata, India, includes a 3-million-square-foot terminal building designed to handle peak flow of 1,800 passengers per hour, which will then double with Phase 2 expansion. The building is designed with open, column-free spaces that allow passengers to pass easily from roadway to aircraft. Upon completion, NSCBI will be a major transport hub for eastern India.

The main challenge of Phase 1 was to design a steel roof spanning up to 99 meters—with a cantilever span of 27 meters—while simultaneously allowing natural light to flood the interior. The project team deployed STAAD.Pro to rapidly experiment with various design solutions. The most economical solution turned out to be a trapezium-shaped steel truss with high-strength structural steel.
Michael Baker Corporation  
Airport Planning Peer Review  
Columbus, Ohio, United States

To meet projected aviation needs well into the 21st century, the Port Columbus International Airport proposed an extensive update to its master plan for expansion. The plan included a five-gate build-outs of the existing terminal facility, a second separate interchange, a new airport traffic control tower, a third parallel runway, dual crossover taxiways, and improved aircraft navigational aids.

Michael Baker created renderings and animation, depicting the proposed expansions for review by aviation authorities and other airport directors using MicroStation and InRoads. The upgrade will reinforce the airport image as the gateway to the region and an airline hub that will continue well into the future.

Mott MacDonald — Arup Joint Venture  
Midfield Development Design Consultancy Services  
Hong Kong, China

As part of Hong Kong International Airport’s new passenger concourse development project, the $899 million Midfield Concourse includes a 100,000-square-meter multilevel building with 20 bridged aircraft parking stands, a pedestrian tunnel extension, and related works. The Mott MacDonald-Arup joint venture, in conjunction with Aedas and Atkins, deployed multiple software platforms to deliver the optimum solution.

The joint venture developed a workflow incorporating products from Bentley, Autodesk, and others. Structural Modeler, Bentley Navigator, InRoads, and Bentley Rail Track allowed project-wide collaboration by integrating disparate software and systems, which saved time during partner interactions and allowed rapid information exchange.
Designing a stormwater drainage system for India’s Mumbai International Airport will have a profound impact on 10 million passengers a year. The goal was to prepare detailed designs, general arrangement drawings, working drawings, specifications, and quality-control procedures on materials and works for an airside drainage system. The design of the facility was based on a detailed drainage plan established in the first stage of the project. The design team expected to use spreadsheets and depend heavily on outside consultants for specific inputs. But Mott MacDonald was able to submit scientific reports using Bentley’s SewerGEMS to save untold man-hours. The interoperable capabilities of the 3D modeling software enabled its use across the lifecycle of the project, which reduced time and effort. Bentley’s integrated solutions produced a one-company accountability approach that proved crucial for the success of the project.

The intersection of roads to the city of Baku, the Absheron peninsula, and the Heydar Aliyev international airport in Azerbaijan was a traffic bottleneck. Compounding the problem was the Pazaar, which had 5,000 selling stalls at the airport entrance, and the proximity of airport signal towers. The new airport interchange will shorten airport commute time by 25 minutes. The project team used MicroStation, InRoads, and Bentley Descartes to complete the project in the shortest possible time. The software enabled the team to find a design solution that would eliminate congestion and support economic development. MicroStation enabled the team to create a 3D presentation and animation for reviewers.
SITE A/S
Norrebro Bryghus Bar – Copenhagen Airport
Copenhagen, Denmark

Developing an identifiable airport bar for Danish microbrewery Norrebro Bryghus at Copenhagen Airport was this project’s primary goal. The design team had to fulfill client intentions while communicating those intentions to the airport. It also had to manage space constraints and communicate with its manufacturer to meet a very tight schedule.

Utilizing MicroStation, TriForma, and Bentley Architecture, the project team communicated by creating visualizations using a 3D model. This identified potential problems, created a forum to discuss solutions, and allowed the team to communicate ideas effectively and effortlessly. The manufacturer also used the model as a basis for its computer-driven construction process.

Warren and Mahoney
Novotel Hotel Auckland Airport
Auckland, New Zealand

Accor’s $57 million Novotel Hotel at Auckland International Airport is designed to capture the character of New Zealand. The 12-level, four-star property presents guests with a sequence of spaces for cultural encounters. Four principles guided the design: global destination, diverse people and environment, New Zealand’s essential qualities, and a lasting hospitality experience.

Warren and Mahoney used MicroStation and Bentley Architecture to streamline workflows and minimize the risk of cost and time overruns. For the Novotel Hotel, visualizations were used to show design intent for signoff. Clash detection was used to coordinate architectural and structural disciplines, and dynamic views were used to create 2D sections in drawings.
Located on New Zealand’s North Island overlooking Cook Strait, Wellington International Airport needed to expand the existing international terminal so that it could provide long-haul flights to Asia. The $34 million expansion increased capacity for nearly every aspect of international arrivals and departures.

The rugged coastline inspired the edgy design of “The Rock,” which evokes the coastal site’s mythological past. The challenge was to optimize a small site left by six previous additions yet maximize available space within the tight constraints of the existing site. MicroStation and Bentley Architecture streamlined the team’s workflow and minimized the risk of cost and time overruns.

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