

**HOK**

**Project:**

Bengaluru International  
Airport Terminal 1 Expansion

**Location:**

Bangalore, India

**Type:**

Airport

**Scheduled Time of  
Completion:**

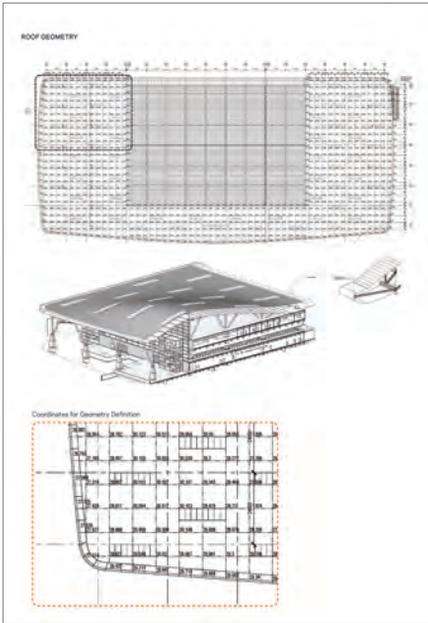
2013 & 2015

# Flying High with BIM

## Airport design uses BIM's diverse strengths



Following a board decision to adopt Revit in 2006, architectural firm HOK now uses BIM on all projects worldwide. These include the Hong Kong team's current work on expanding Bengaluru International Airport in south India, a project that benefits in various ways from BIM's diverse strengths.



HOK is lead designer of the expansion, which is adding additional gates to the east and west of the existing Terminal 1 together with a new pier. These additions are unified with an elegant hyperbolic roof. Complexities of the project include the integration of new baggage handling systems, amendments to security arrangements and significant construction zones wrapping around the fully functional existing airport.

The design team has embraced the BIM approach for the entire project. “The client can get a better understanding of the design via Revit’s inherent 3D environment, and therefore become more engaged with the design process,” says Mr. Benjamin Thomas, Senior Design Architect, Associate with HOK.

The BIM model also helps the HOK team to work closely with other consultants involved in the airport expansion – notably Arup engineers, who are responsible for mechanical, electrical and plumbing systems (MEP); the façade; structural engineering; and the baggage handling system.

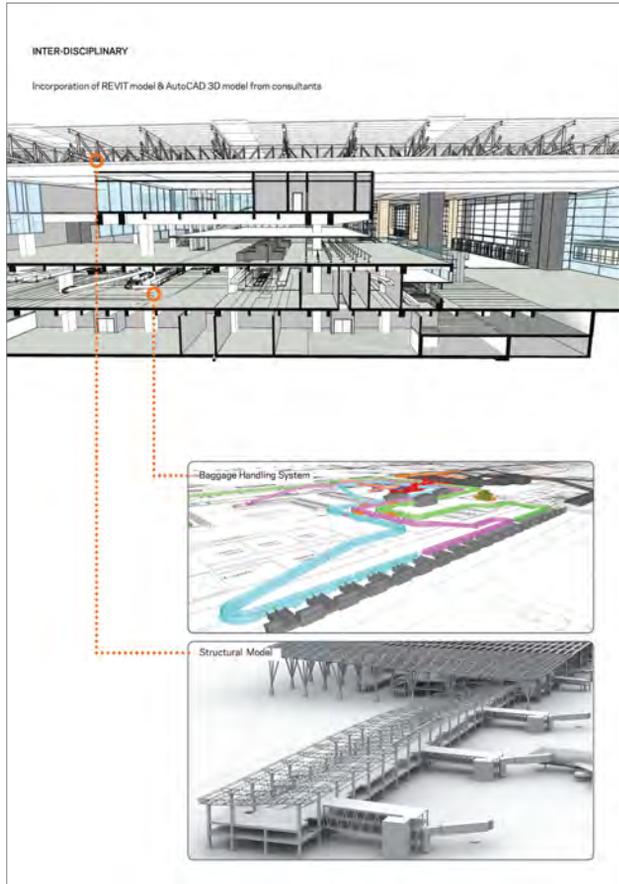
## Baggage Handling System Pivotal to the Project

“The baggage handling system is one of the biggest components inside the airport,” says Mr Thomas. “The planning of the BHS is critical to minimise the impact on other airport operations together with passenger and staff flow.”

The baggage handling system was fixed early in the design process. Arup developed the system using intelligent blocks with a host of technical data, such as the speed, direction, orientation, and length of individual conveyors. They passed the MEP model to the HOK team, who imported it into the Architectural model to complete the design.

“The BIM model was a massive help in the design process,” says Ir. Andrew Mole, Associate Director of Arup. “There is only so much information you can show in 2D drawings, since they must be interpreted to understand the full spatial information. 3D models communicate better.” The BIM model allowed creation of multiple views of the airport design, with minimum additional effort. It was essential in assessing coordination issues, for example helping in ensuring that where required the baggage system could rise over corridors or dip below basements without clashes arising.

Additionally, rendered 3D views were used to review the design with baggage operations management and staff. Jonathan Roberts, Senior Consultant with Arup, explained, “The 3D images of the system enable non-technical stakeholders to far better understand the facilities that they will be getting. This results in far more valuable questions than had they seen only 2D drawings. In particular, the advantages and disadvantages of different options can be easily conveyed and very robust decisions can be achieved.” For example, it was relatively easy to assess the spaces available for contingency handling, an issue of great importance because of the potential impact on the entire airport operation should the baggage system experience a major stoppage.



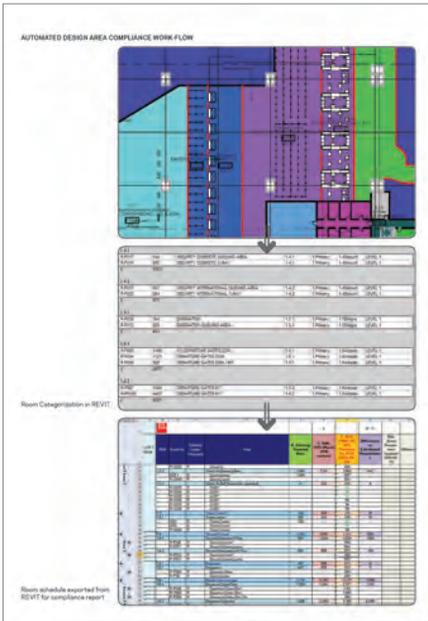
### Well Coordinated Roof Structure

The roof structural steelwork was similarly imported into Revit, for coordination with the architectural model. “There was a considerable advantage to using the BIM model for the roof,” says Mr Thomas. “For instance, we could effectively cut away portions of the model, to create 3D sections, and show how the roof form related to the rest of the project.”

The ARUP team modelled the roof’s truss structure, for coordination discussions with HOK on how it would fit within the architectural skin. ARUP also resolved roof drainage issues whilst maintaining the roof’s aesthetic quality.

### Modelling Lighting

By importing Revit data to Ecotect Analysis, the BIM model helped with determining



the position and number of skylights, as well as the materials used for the building facade. Ecotect allowed initial assessments of lux levels at different times of day and with varying sun positions, as well as ways materials with certain qualities would affect the quality of light.

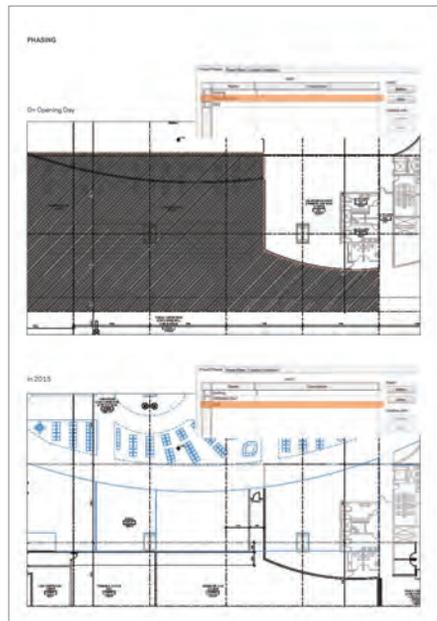
## Rooms, Lifts and Staircases

“We have very specific area requirements for rooms and processing functions, such as those for immigration and security,” says Mr Thomas. “We could efficiently cross check the configuration of the BIM design with the requirements, and present this data to the client.” When changes are needed, such as moving an office to another location, Revit recalculates design information, and the new file can be exported to Excel for compliance and reporting.

The BIM model is also a boon for information on around fifty escalators, lifts and staircases between floors; designers can quickly see where these start and finish, coordinate with structural arrangements and then extract this information into a vertical transportation schedule.

## Phasing the project with BIM

The building information model also helps with showing how the expansion will proceed in phases. The HOK team has produced each building component in the building information model with a ‘time’ of construction. When the designer wants to present the design for any phase of the project, only those building components belonging to that phase appear. Drawings can be prepared for contractors, according to different construction phases.



Throughout the design process, the HOK team found the client was very impressed with the 3D models. Revit enabled HOK to quickly update designs, whilst there were better communications with the client than had traditional 2D drawings been used.

### No Going Back to 2D Design

Though the BIM model proved a boon for the project, no member of the team can imagine life without BIM. “Revit allows everyone to fully engage with the design process, allowing valuable coordination and input to result in a better designed product for the end user,” Mr Thomas adds. “Design is a very collaborative exercise – relevant input at all stages is critical and therefore I can see the future of this software evolving from a centrally based office

network to one which allows people to roam and collaborate from remote locations using network clouds.”

Ir Andrew Mole likens the emergence of BIM to the earlier switch from paper to computer-aided design. “At first, it is not so efficient as people try to fit it into the old ways of working. But as they use it and become familiar with its strengths, they start to see the efficiencies, and there is better coordination.”

*\* All images in this article provided by HOK*





## ABOUT HOK

HOK was founded in St. Louis by three principals – George Hellmuth, Gyo Obata and George Kassabaum in 1955. With the vision of being the world's leader in innovation for the built environment, they have successfully made their expertise available across the globe in the last 50+ years. HOK is currently operating from 25 established office locations with more than 1,800 employees and their projects can be found in almost every continent in the world.

Their continuous success has been regularly acknowledged by industry watchers, their 2010 recognitions include:

- #1 Architectural/Engineering Firm, Building Design + Construction
- #1 Architectural/Engineering Firm, Engineering News-Record
- #3 Green Design Firm, Engineering News-Record
- #4 Interior Design Practice, Interior Design
- #4 Architectural Firm, Building Design (UK)

Their ability to collaborate across markets and disciplines in every part of the world allow them to see the “big picture” and, because they approach design from so many different perspectives, gives them an unparalleled ability to innovate.