One BIM Model for Designers on Three Continents

COMPANY
BTA & RLP Company Limited

PROJECT
Xiqu Centre

LOCATION
West Kowloon Cultural District, Hong Kong

TYPE
Theatre and Retail

SCHEDULED TIME OF COMPLETION
2017

"A theatre is one of the most complex building types, and for coordination of services, you need a tool like BIM."

—**Eugene Y.Y. Ching**
Associate Director
Ronald Lu & Partners

"The design of the Xiqu Centre required a real -time collaborative process involving many international experts due to the complex nature of this sophisticated building typology. The Revit BIM platform was key to achieving a successful outcome."

—**Earle Briggs**
Director
BING THOM ARCHITECTS

BIM PARTNERS INVOLVED

West Kowloon Cultural District Authority
Buro Happold International
Rider Levett Bucknall
Atkins China Ltd.
Front Inc.
Hip Hing Construction Co. Ltd.
Kingsfield Engineering Ltd.

Image courtesy of BTA & RLP Company Ltd.

The Xiqu Centre being built in Hong Kong's West Kowloon Cultural District (WKCD) will be one of the first arts and cultural venues to open in the district, and is dedicated to promoting the rich heritage of Xiqu performances. It features two auditoriums, one for full scale performances and another more intimate"traditional tea house", along with expansive public leisure space.

The project is designed by BTA & RLP Company Limited (BTA & RLP) which is a joint venture company of Canada-based Bing Thom Architects (BTA) and Hong Kong-based Ronald Lu & Partners (RLP). Together with BTA's extensive theatre and cultural facility design experience and RLP's local knowledge and expertise on the recently completed Koshan Theatre annex, BTA & RLP won the competition for the Xiqu Centre.

Inspired by the concept of 'flow' or 'qi'

Mr Ching notes that West Kowloon Cultural District Authority were forward thinking enough to require the use of BIM in the design process for all WKCDA projects as part of the Consultancy Agreement. In addition the BIM model will be employed by the Authority for faculty management of individual projects. "A theatre is one of the most complex building types, and for coordination of services, you need a tool like BIM," says Mr Ching.

"The design is inspired by the concept of 'flow' or 'qi', with interiors that are both curvilinear in plan and form," adds Earle Briggs, Co Managing Director, Bing Thom Architects - who has set up a Hong Kong office to work on the Xiqu Centre. "For non- orthogonal geometry in the public areas of the building including the main theatre, it was not possible to design it in 2D – you need 3D." Like Ronald Lu & Partners, Bing Thom Architects has extensive experience of BIM, which they began using in 2004, and it's now their tool of choice for design and documentation on all major projects. For the complex geometry, dimensional control relies on Revit model rather than dimensions marked on drawings, resulting in reduced time for drawings production.

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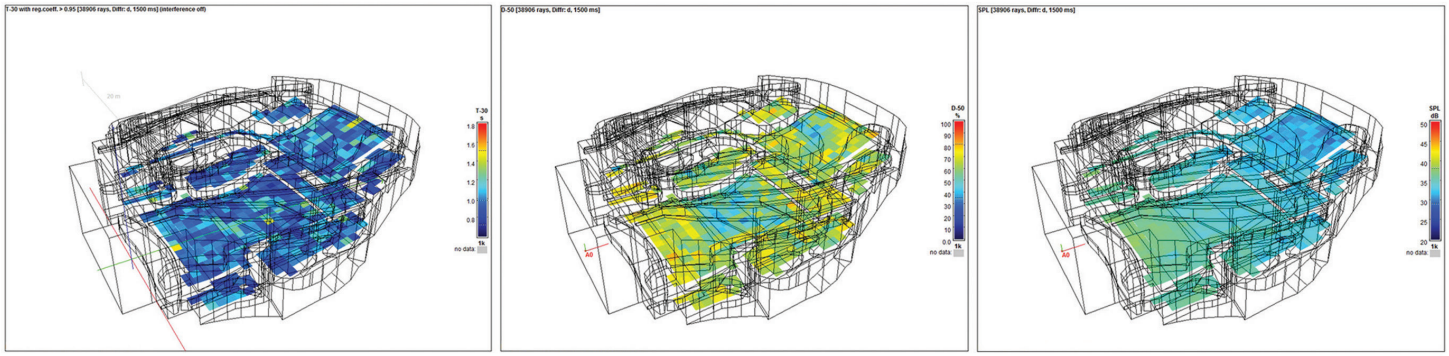


Image courtesy of BTA & RLP Company Ltd.

"The design of the Xiqu Centre requires a real-time collaborative process involving many international experts due to the complex nature of this sophisticated building typology. The Revit BIM platform is key to achieving a successful outcome", says Mr Briggs. Though BTA & RLP's office in Hong Kong is the hub for the design, there's an international team of specialists at work, including acoustic, theatre, landscape, performance video, performance sound and communication lighting and additional support from BTA's Vancouver office Using BIM enables team members to work together and maintain the high standard of consistency and design quality, sharing the same information in real time. "With team members working simultaneously on three continents, and over 20 people collaborating on the model at the same time," says Mr Briggs. "We really felt like we were breaking new ground by maximizing our resources for production, while working across continents."

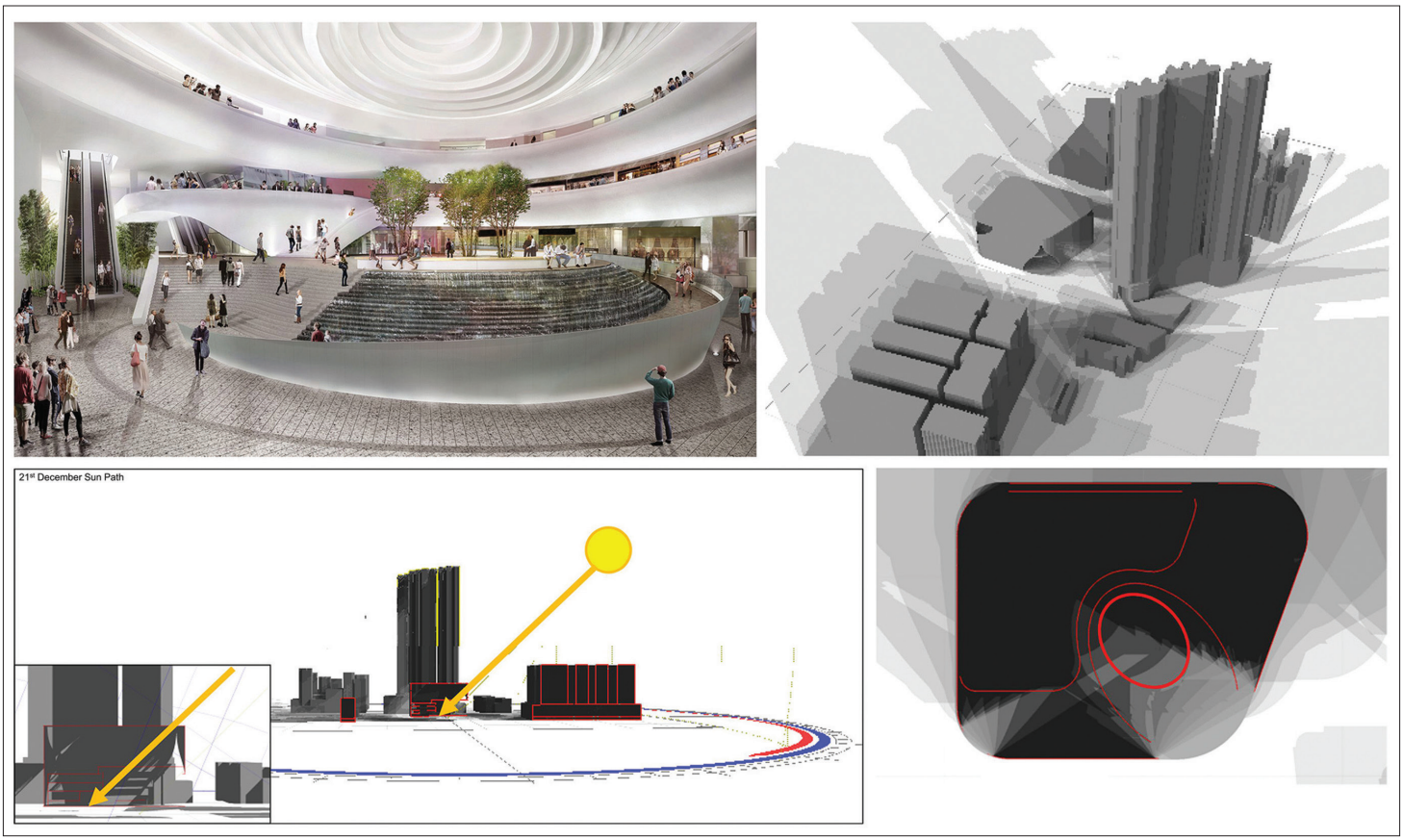
The model is kept on Revit Server, but with 1.5GB of information, it's significantly larger size of a normal model, which has resulted in some issues with delays in loading and saving. Network optimization has boosted speeds, significantly increasing efficiency.

Face-to-face communication helps too

Another apparently appealing option for boosting speeds was to reduce file sizes by splitting the design into several models. "In theory splitting would work perfectly for most building types, but for our case, everything is closely tied together," says Alvin Y.H. Kung, Architect, Ronald Lu & Partners. Difficulties included loss of information when models were linked together again, and the team eventually settled on models for the main building, the theatre, and the facade.

Paradoxically, while able to cooperate around the world, the Hong Kong team members found it was best to move into one space, for face-to-face communications between architects working on the same aspects of the project. "This has made a good atmosphere to collaborate," says Mr Kung. "The way you draw in Revit is more interactive than in CAD this is especially important as a lot of changes may happen with a very few moves."

Working with BIM has helped to find and resolve design changes. Mr Ching explains this is especially important with the Xiqu Centre, as only the basement is in concrete, while the remainder of the building is steel, "and it's not so forgiving - it's delivered on site, and you cannot cut a steel truss." Plus, the contractors can better understand the design than they would with 2D drawings. These benefits have been proven in early construction stages, with the foundations and basement



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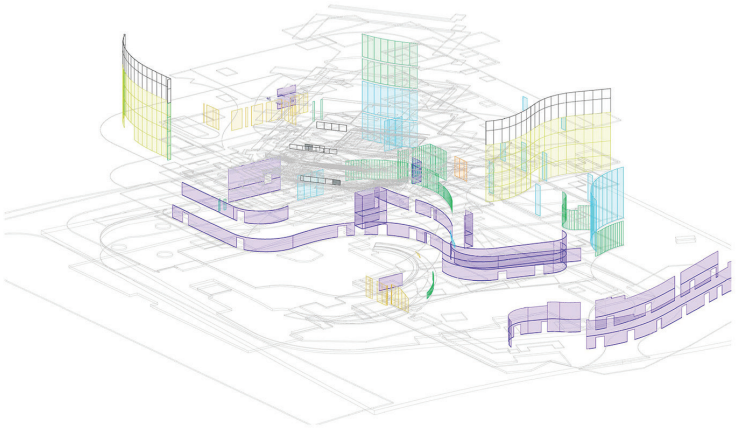


Quantity Take-Off - Glazing (excluding punched windows)		
Family and Type	Area	Type Comments
System Panel: Exterior Acoustic Glazing	467.1 m²	Cyan
System Panel: Exterior Glazing (System A)	408.0 m²	Green
System Panel: Exterior Glazing (System B)	642.4 m²	Lime
System Panel: Interior Acoustic Glazing	15.2 m²	Orange

Quantity Take-Off - Storefront Glazing		
Type Mark	Area	Type Comments
GP	1,298.500 m²	Purple
Interior	123.6 m²	Yellow
Spandrel	285.9 m²	White

Image courtesy of BTA & RLP Company Ltd.

work completed, and construction of the superstructure underway.

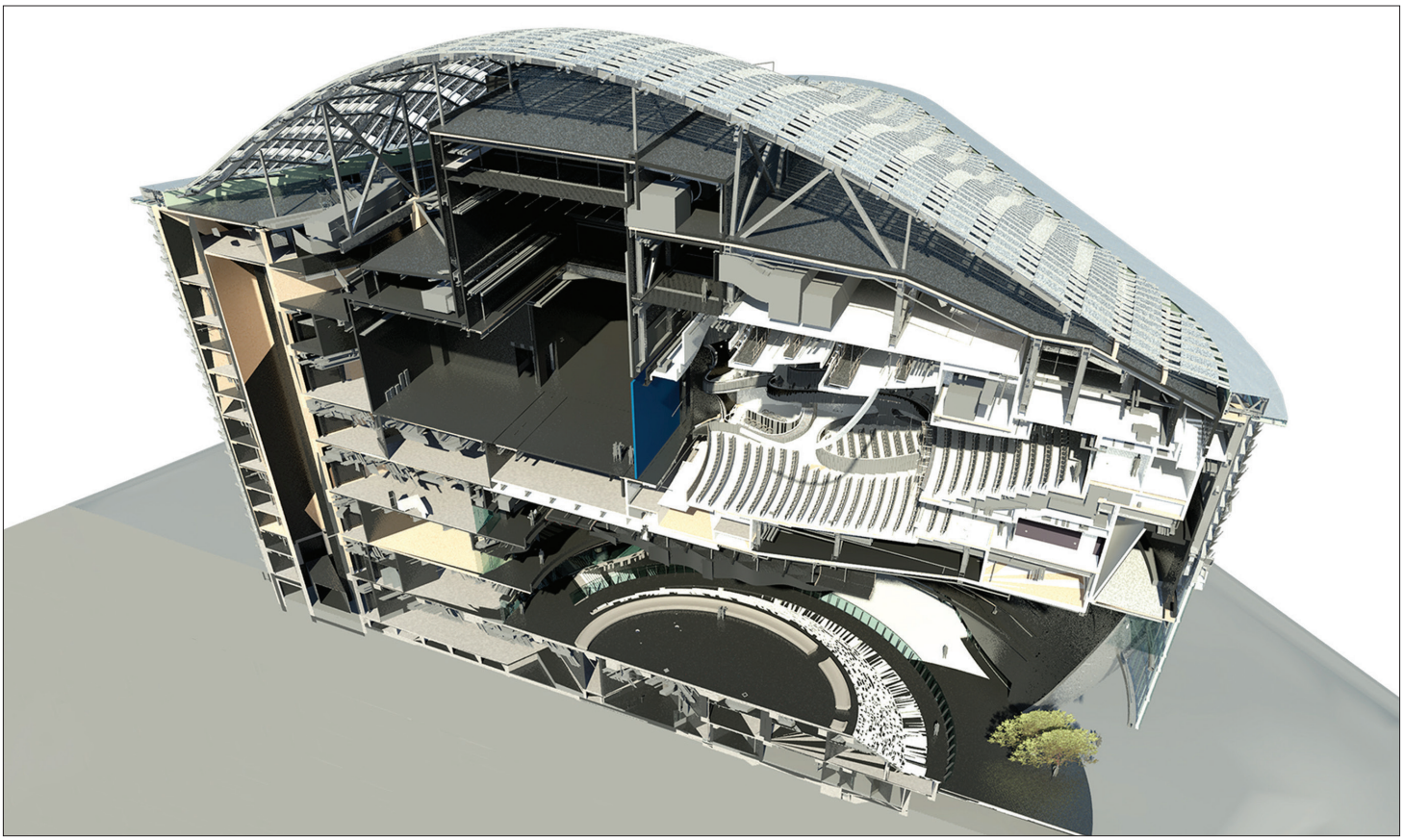
"A big advantage of the model, which we used from the very beginning of the design process, is the capability to create visualisations, spatial walkthroughs using both Navisworks and Showcase," says Mr Briggs. "You can create a path through the building, and visualize elements and spatial qualities you were not aware of. It's very helpful."

Further models and a full-scale mock-up

The virtual images including animations also helped the Client to understand the space and design concept, and allow them to check that the facilities will suit their need by using BIM, which the design team learned, include needing 3.7-metre clearances so some performers can walk through with full headgear.

Design consultants are also making use of the model. Fisher Dachs Associates theatre consultant, in New York, has used the model to ensure good sight lines, manipulating seating levels to optimize views to the stage. The model has been taken as the basis for acoustics study by Sound Space Design, enabling the acoustics experts to create a more precise model than they could from 2D drawings. Based on the integrated BIM model, researchers at the University of Ontario have built physical models for wind tunnel testing, partly to check, for pedestrian comfort, the semi-enclosed plaza won't itself become like a wind tunnel.

The BTA Vancouver office has printed the main theatre model and major section of the building, finding that having a physical model helps visualize design. In addition, 1:1 scale models were printed to review custom designed supports for cladding system to maintain the high standard of consistency and design quality since the BIM is shared among consultants across the disciplines.



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About Ronald Lu & Partners

Ronald Lu & Partners (RLP), established in Hong Kong in 1976, is an award-winning practice specializing in architectural and interior design and master planning. The firm has completed and is engaged in wide variety of projects, including large-scale integrated urban developments, transit-oriented developments, commercial buildings, residential developments, and cultural and public developments. RLP has received over 110 local and international accolades for its exceptional projects, in particular the Zero Carbon Building, Academic 3 of the City University of Hong Kong, the China Resources Building and Pak Tsz Lane Park. RLP has offices in Hong Kong, Beijing, Shanghai, Guangzhou and Shenzhen, housing its strong team of over 600 staffs.

About Bing Thom Architects

Bing Thom Architects (BTA) is an innovative Canadian architectural practice with an emphasis on civic and institutional projects. Founded in Vancouver in 1982 by Hong Kong born and Canadian raised architect, Bing Thom, the firm has a staff of over 45 who originate from a dozen different countries and bring equally diverse language skills and cultural understanding.

BTA is passionate about the positive social and economic value that architectural excellence brings to communities and been the recipient of numerous honours and awards, including the 2011 RAIC Gold Medal, Canada's highest honour in architecture. In 2012, BTA set up an office in Hong Kong and together with local Hong Kong architect, Ronald Lu & Partner, pursued and won the international design competition for Hong Kong's Xiqu Centre. BTA has followed this success with the award of further projects in Hong Kong.