

COMPANY

Architectural Services Department,
HKSAR Government

PROJECT

Eastern District Cultural Square

LOCATION

Shau Kei Wan, Hong Kong

TYPE

Public Open Space and Amphitheatre

SCHEDULED TIME OF COMPLETION

2018

BIM Enables Sound Checks and More for Signature Project

“BIM allowed accurate specification of sizes and costing. Also, we used BIM to test whether more identical panels can fit the design, and eventually standardised 30 percent of the panels.”

—Kevin Li

Senior Architect, Architectural Services Department

BIM PARTNERS INVOLVED

Shen Milson & Wilke Limited

Advanced Construction Information Development Limited



Overall view of Eastern District Cultural Square
Image courtesy of Architectural Services Department, HKSAR Government

Complex amphitheatre set to host events delighting audiences while not disturbing neighbours - through design made possible by BIM

Eastern District Cultural Square is a signature project in Eastern District, aiming to revitalise the waterfront by attracting more visitors – notably by featuring an outdoor performance stage with canopy, together with a square for up to 1000 spectators. The project design is by the Architectural Services Department.

“You rarely find outdoor theatres, due to the low efficiency of sound barriers,

and typically poor sound quality,” says Helen Wong Hoi-ming, Project Architect, Architectural Services Department. But for this stage, the design team is employing BIM to minimise excess sound, optimise sound quality for the audience, while ensuring the structure is buildable and can be completed within budget. “From sketches to detailed design to the tender stage, the entire project embraces BIM,” says Ms Wong.

Optimising sound and vision

A major challenge for the project is to design an effective shelter for the outdoor



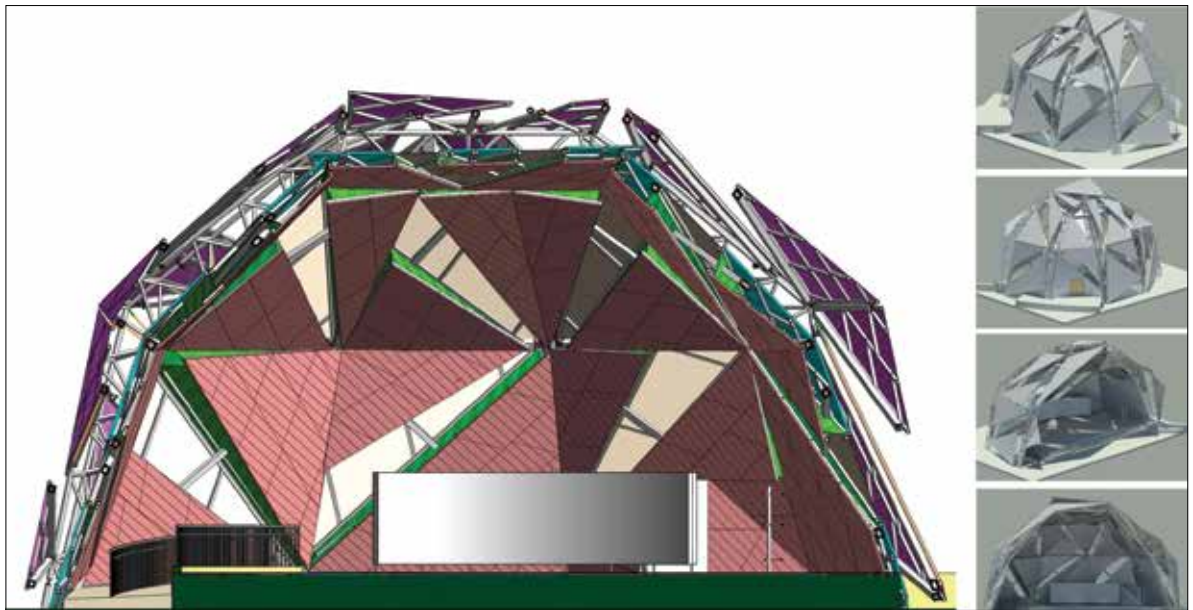
Noise mapping output for noise level distribution at noise sensitive receivers
BIM is used as a tool to select the types of music acceptable for this cultural square
Image courtesy of Architectural Services Department, HKSAR Government

amphitheatre. This will mainly comprise an acoustic aluminium cladding system, which will minimise sounds reaching nearby noise sensitive receivers including a temple, a school and residential premises.

“The acoustic consultant used BIM models to check and ensure the geometry is correct to evaluate the impact of different kinds of music - finding pop, jazz and Chinese opera are okay, but there should be no rock music,” says Ms Wong. “They also tested different forms, such as with walls to serve as noise barriers.”

Also using the model, the consultant checked different arrangements of speakers, verifying there will be a balance of reflection and absorption to achieve optimum sound quality. “Using BIM enhances precision of the design,” says Ms Wong.

Using a process that was only possible through using BIM, the team also tested glazing with different opacity levels, to



Combining noise barriers of different heights and roof design to achieve the most optimal noise barrier performance. The use of steel structure minimise building bulk Image courtesy of Architectural Services Department, HKSAR Government

achieve the optimal stage lighting effect.

BIM copes with complex shape

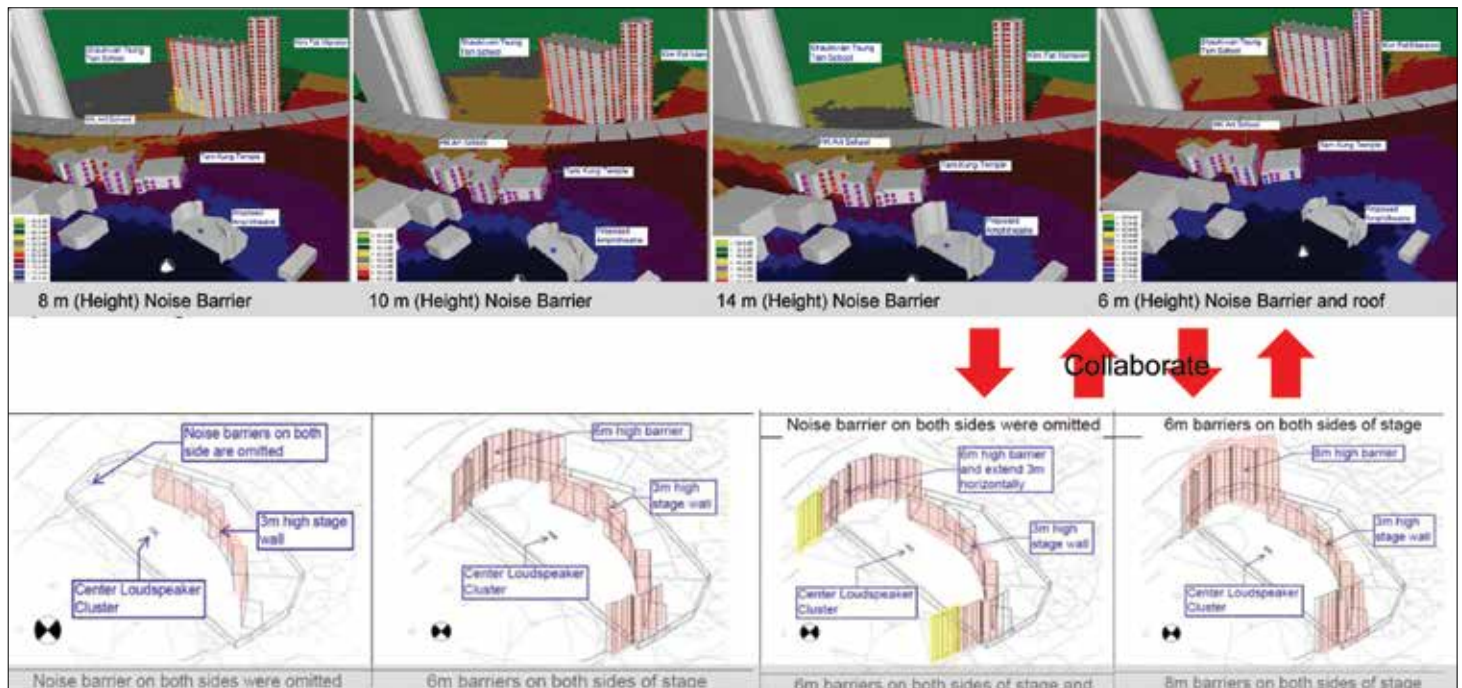
The amphitheatre shelter has a complex shape, which would be extremely challenging to design using traditional 2D drawing – requiring not only technical skills, but also extreme imagination.

“Different elements form different planes,” says Lau Tat-ying, the Design Team Leader of the project, Architectural Services Department. “Determining elements’ lengths, angles, and how they are fixed into each other could not be done in 2D drawings. With BIM, we

show the real situation of how they join together, and can ‘explode’ views of certain elements.”

During the design stage, when the designed structural members and aluminium panels were integrated in the BIM environment, the sizes of certain structural members were too slim to anchor aluminium panels attached to them. The design team corrected the sizes, and verified the connections - solving an issue that in traditional practice would have only been discovered during construction.

The BIM model was also employed in



Acoustic Analysis with the help of BIM to determine the most appropriate Architectural Form Image courtesy of Architectural Services Department, HKSAR Government

analysis to ensure the shelter will be structurally sound, and a maintenance platform can be used.

Effective costing with BIM

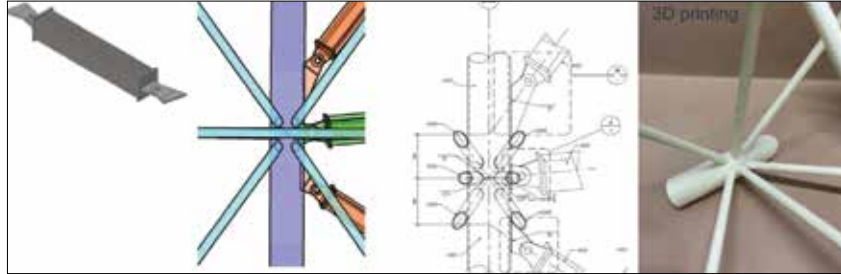
By employing BIM, the project team specified the design accurately, minimizing the need to include a risk premium for uncertain design details.

Plus, it was also possible to provide detailed specifications for structural elements, and standardise as many as possible, to further optimise the project cost. "The panels are tilted, so there's no way to determine their sizes and costs in 2D design," says Kevin Li, "But BIM allowed accurate specification of sizes and costing. Also, we used BIM to test whether more identical panels can fit the design, and eventually standardised 30 percent of the panels."

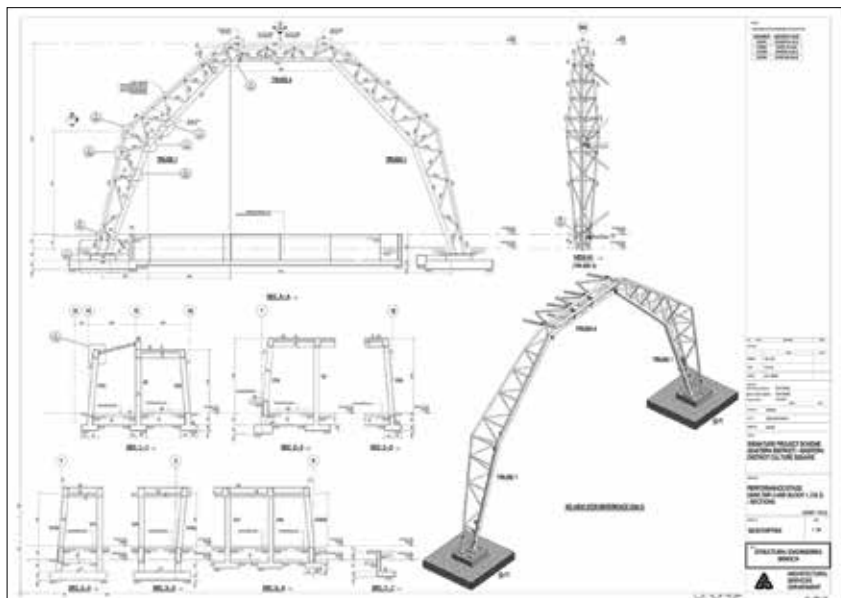
Visualising aided by 3D printout

Drawings from the BIM model can help the project team members and the contractors understand the design easily and hence avoid misunderstandings. Plus, physical models of designed members have been produced by 3D printing, enabling project team members to fit them together rather like jigsaw pieces, and optimise their design to greatly enhance the buildability of the project.

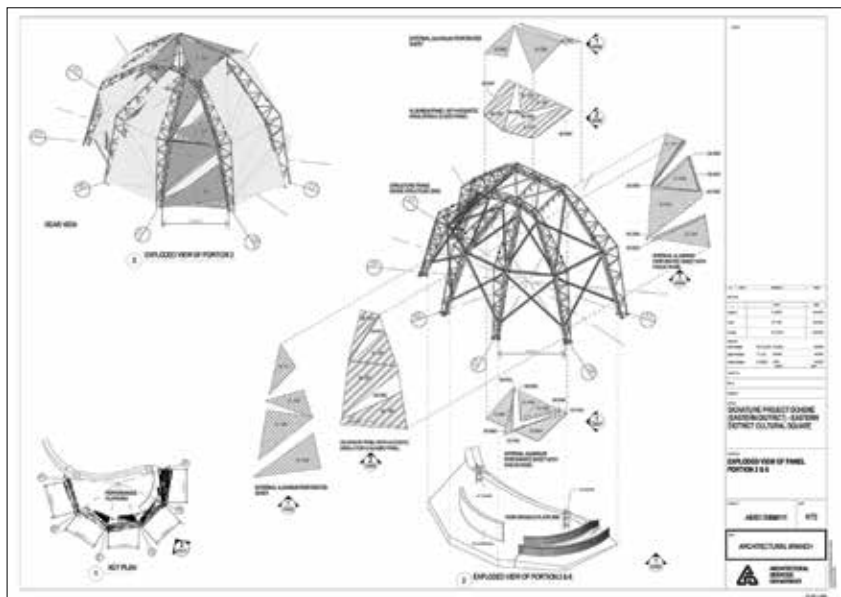
The team also created a 3D printout of the entire amphitheatre shelter design, which is an accurate scale model that sits on the palm of a hand. The Home Affairs Department, a key project client, has been impressed by this along with the drawings - without which, they may not have really appreciated the design until the shelter was built. "Also, we brought the 3D printout to a District Council meeting, where the District Councillors passed it round," says Mr Lau "They loved it."



3D printed connection details are used to test the buildability
Image courtesy of Architectural Services Department, HKSAR Government



Structural tender drawings and statutory submission drawings are prepared by Revit
Image courtesy of Architectural Services Department, HKSAR Government



Architectural tender drawings are prepared by Revit. Different layers of cladding are demonstrated in 3D in tender drawings
Different from traditional drawings, 3D Visualisation in tender drawings allows better communication with tenderers
Image courtesy of Architectural Services Department, HKSAR Government



Overall view of Eastern District Cultural Square
Image courtesy of Architectural Services Department, HKSAR Government

About Architectural Services Department, HKSAR Government

Architectural Services Department (ArchSD) performs the following three core functions in relation to Government-owned and Government-funded facilities:

- 1) Monitoring and advisory services;
- 2) Facilities upkeep; and
- 3) Facilities development.

Architectural Services Department (ArchSD) of the Government of Hong Kong SAR commits to provide quality services to the public which performs monitoring and advisory services, development and upkeep of government-owned buildings and facilities since 1986. ArchSD promote best practices in the building industry with quality professional advisory services to ensure the quality and sustainable development of community facilities. In recent years, ArchSD projects received some recognition including but not limited to the Hong Kong Institute of Architects Annual Awards, the Hong Kong Institute of Landscape Architects Design Awards, Quality Building Award and Green Building Award.