

COMPANY
Gammon Engineering & Construction Company Limited

PROJECT
Global Switch Hong Kong - Design and Built Data Centre at TKO

LOCATION
18 Chun Yat Street, Tseung Kwan O

TYPE
Design and Construction

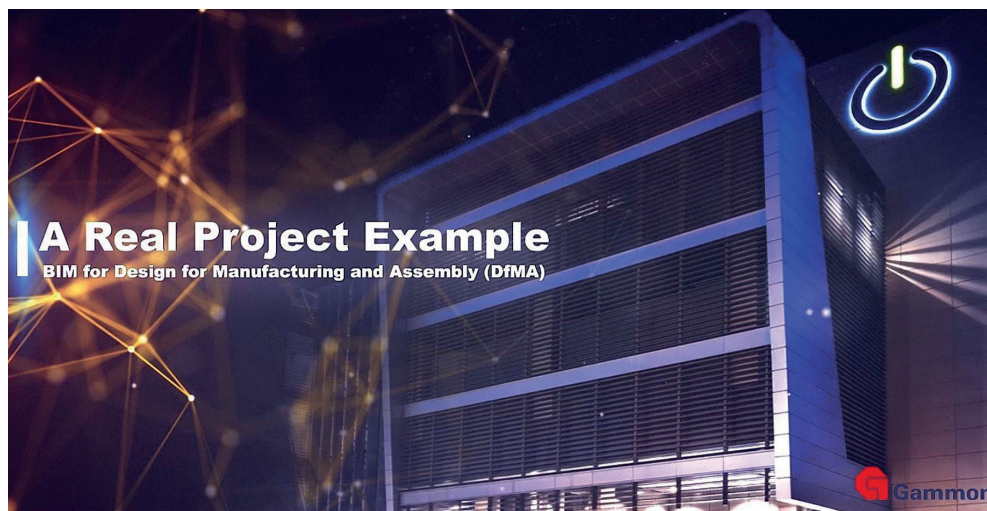
SCHEDULED TIME OF COMPLETION
2020

A Real Project Example – BIM for Design for Manufacturing and Assembly (DfMA)

“With the recent development of Building Information Modelling (BIM), we successfully integrated our Design for Manufacturing Assembly (DfMA) with the aid of BIM. The project showcases different real job examples of how DfMA could be implemented, achieving a much higher safety and quality standard. Gammon believes continuous development together with the support of Autodesk could further facilitate the construction industry evolving from traditional methodology to a more innovative approach throughout the whole project cycle.”

—Victor, Tse Wing Fung
 Senior Project Manager,
 Gammon Engineering & Construction Company Limited

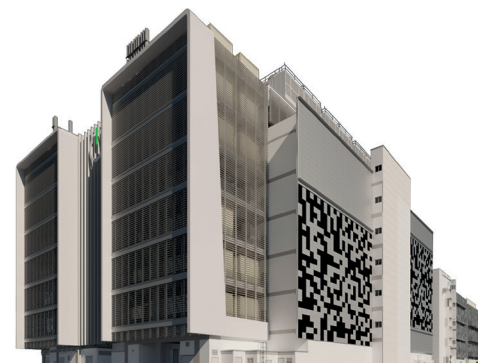
- BIM PARTNERS
- Global Switch
 - DCMS
 - Meinhardt
 - Aurecon
 - Integrated Design Limited
- AUTODESK PRODUCTS USED
- 3ds Max
 - AutoCAD
 - BIM 360 Glue
 - CFD
 - Dynamo for Revit
 - Fabrication CAMduct
 - Navisworks Manage
 - Navisworks Simulate
 - ReCap™ Pro
 - Revit



A real data center project highly adopted with BIM. Image Courtesy of Global Switch

Global Switch Hong Kong Data Centre

Global Switch Hong Kong is a design and build project with a scope that includes substructure, superstructure, electrical and mechanical, façade, fit-out and maintenance works. It is currently the largest data centre in Hong Kong. As the main contractor, Gammon is responsible for all works, which are being delivered with the support of in-house expertise. The project makes full use of BIM for coordination and manufacturing, as well as handover throughout the different stages of the project’s life cycle.



BIM rendering of building outlook. Image Courtesy of Global Switch

As Hong Kong’s largest carrier and cloud-neutral data centre, the facility has 70,000m2 of world-class infrastructure services. Located adjacent to the Tseung

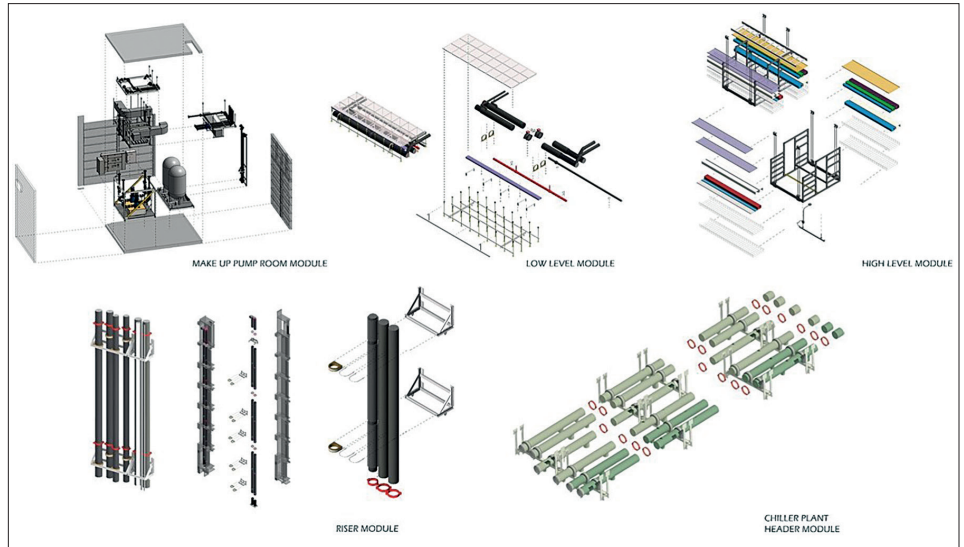
Kwan O cable landing station and close to both other major submarine cable landing stations and the Hong Kong Stock Exchange hosting facility, it provides a full range of colocation, cloud and managed services.

Building L2 - Data Input Status	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	Total	Area Related Percentage
Structure	100	100	100	100	100	100	100	100	100	100.00%
Control & Monitoring	250	487	488	483	208	87	0	24	2150	100.00%
Electrical	811	509	500	503	426	78	0	20	2499	100.00%
Fire Systems	195	195	192	190	118	43	0	50	893	100.00%
General Building Equipment	375	421	414	416	237	14	0	46	1995	100.00%
Generator Systems	43	64	64	64	43	7	0	3	208	100.00%
HVAC	118	323	323	323	181	16	32	5	487	100.00%
Security Systems	112	77	77	77	82	22	0	103	579	100.00%
Total Areas	1910								9150	100.00%

Digital asset data storage in BIM. Image Courtesy of Global Switch

Global Switch is a leading example of an environmentally sustainable data centre, incorporating innovative design initiatives aimed at achieving long-term energy efficiency. This is reflected in its achievement of a Leadership in Energy and Environmental Design (LEED) Platinum Rating. It is also targeting the Hong Kong Green Building Council’s BEAM Plus New Build Gold rating. The project was highly demanding in terms of accuracy and quality of BIM in order to align with global standards, with similar data centres operating around the world including

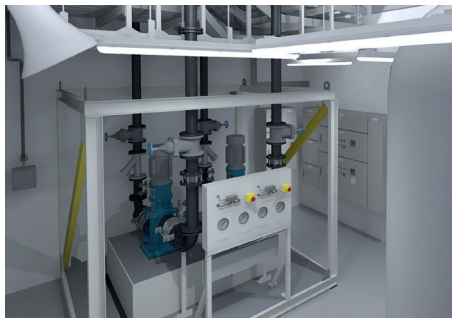
in London, Amsterdam, Sydney and Singapore. Accuracy was extremely stringent in terms of geometry location. In fact, the facilities management team required over 20,000 asset entries in the digital model. The contract greatly encouraged new BIM technologies so that stakeholders can enjoy the values and benefits the latest BIM has to offer. The successful adoption of DfMA is what we would like to showcase.



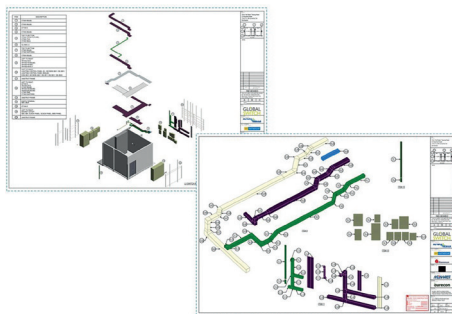
Modularization & DfMA were highly adopted in the project. Image Courtesy of Global Switch

BIM for MiC / DfMA

Not simply a slogan, BIM was fully utilized at Global Switch Hong Kong from the beginning. This included design coordination, construction and as-built



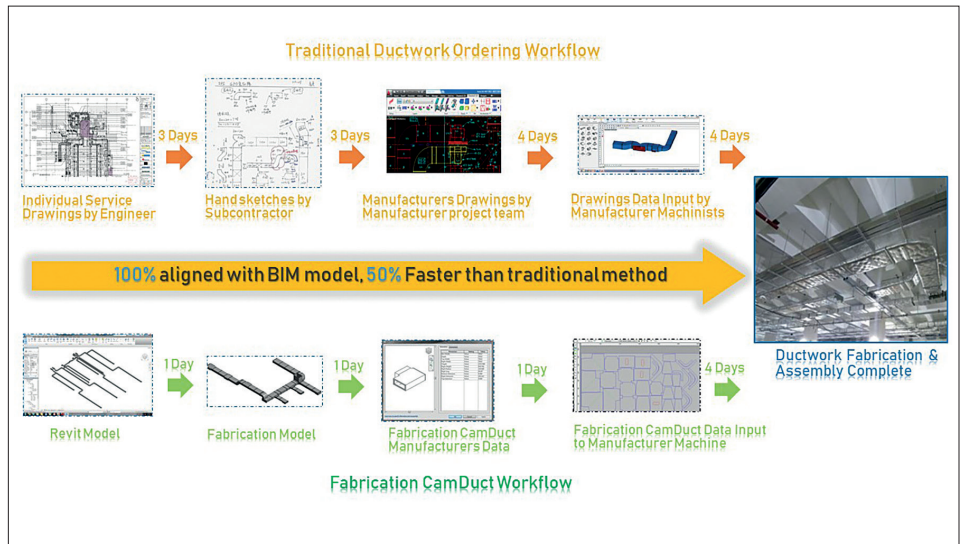
Modularized plant room facilitate to achieve just in time installation. Image Courtesy of Global Switch



DfMA plant room designed by BIM for manufacture. Image Courtesy of Global Switch



Automatic CNC cutting. Image Courtesy of Gammon Engineering & Construction Company Limited



Time & cost being trimmed by adopting DfMA in ductwork. Image Courtesy of Gammon Engineering & Construction Company Limited

handover, all of which is testament to Gammon's strong culture in the use of BIM and MiC /DfMA.

In addition to standard BIM operations, the BIM team also took the initiative to step out of its traditional support role. Joining the project team from the design phase to share some of their duties, the role of the BIM team evolved to become multi-functional.

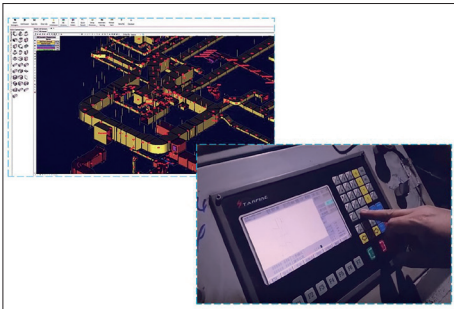
Modular units were built at a remote factory and transported to the construction site. Logistics from the factory and hoisting operations on site were also demonstrated using 4D BIM methodology, ensuring modules could be completed in one go to eliminate many potential safety risks such as working at height and fire hazards; hot works moved offsite to a controlled environment with production at factory standard.

By implementing BIM technologies in a MiC / DfMA approach, the project was successful in delivering many modular applications such as integrated high-level corridor modules, integrated low-level corridor modules, riser modules, modular plant rooms... etc.

Ductwork Fabrication

Traditional ductwork fabrication requires on-site measurement by engineers and subcontractors. This information is consolidated to become fabrication drawings, which are sent to the manufacturer for production. However, this process was time consuming and prone to human errors.

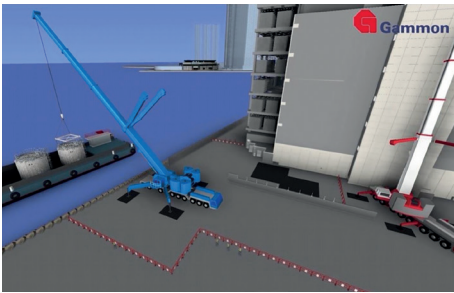
To address this, Autodesk Fabrication CAMduct was adopted at Global Switch Hong Kong to develop ductwork DfMA. As there are currently no manufacturers



From Autodesk CAMduct to CNC Machine.
Image Courtesy of Gammon Engineering & Construction Company Limited

supporting this type of DfMA, all ductwork and fittings had to be manually created in Revit. The created custom database then became the basis, containing all fabrication parts required for CAMduct. The ductwork DfMA with Autodesk Fabrication CAMduct allowed the factory to directly fabricate ductwork using laser cutting. Overall, the workflow duration was shortened by 50% compared with traditional methods. This methodology was applied to over 70% of the ductwork throughout the project life cycle.

conceptual model was built-up as a base, with the design process streamlined through BIM to review feasibility such as spatial requirements, structural integrity, temperature profiles and water flow pattern with CFD. Upon approval of the design by the client, the project team was able to approach the specialist manufacturer much earlier than normally possible.



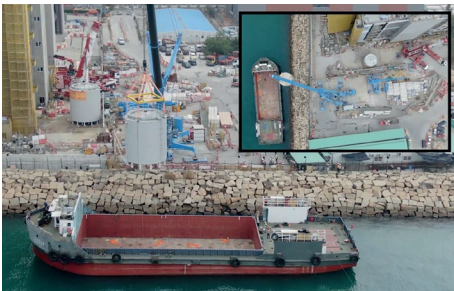
Simulation for large scale operation of the installation of heaviest MiC thermal tank in Hong Kong.
Image Courtesy of Global Switch

Design Coordination and Fabrication of the Heaviest MiC Thermal Tanks in Hong Kong

One of the most impressive MiC achievements in Hong Kong was the design and fabrication of the region's heaviest MiC thermal tanks at Global Switch. Starting from scratch, the

Logistics and hoisting method statements were also coordinated with the use of BIM. Together with the client's representative, manufacturer, logistic contractors, in-house safety and trade engineers, the methodology was clearly communicated and reviewed together using 3D simulation.

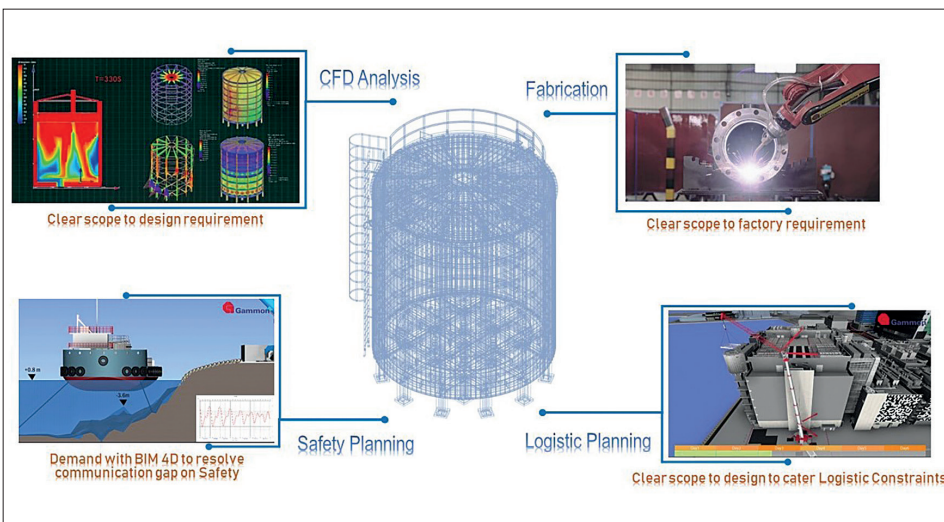
This successful experience makes the project a benchmark for DfMA in the future and showcases Gammon's capabilities as a digital contractor.



Hoisting operation of the heaviest MiC thermal tank in Hong Kong.
Image Courtesy of Global Switch



The MiC thermal tank weighted 50 ton each being just-in-time installed to the site.
Image Courtesy of Global Switch



BIM adopted through out the Design, Pre-fabrication, Hoisting, Installation & Operating.
Image Courtesy of Global Switch



Global Switch Hong Kong - Design & Built Data Center
Image Courtesy of Global Switch

About Gammon Engineering & Construction Company Limited

Gammon has a reputation for delivering high-quality projects throughout China and Southeast Asia. Our integrated business focuses on civil, building, foundations, electrical and mechanical, facades and interiors works and design, and our construction services division provides considerable plant and steel fabrication and concrete production capabilities. We have a strong building and information modelling department and a digital entity dedicated to furthering the commercial opportunities of our innovations.

We focus on our customers' needs and how we can best use our abilities and resources to add value for them through innovative and sustainable solutions. We pride ourselves on the imagination, skill and high standards we apply to all of our projects.