

COMPANY

Hong Kong Observatory,
HKSAR Government

PROJECT

Development of a three-dimensional (3-D) Building Information Model (BIM) for the Hong Kong Observatory's (HKO) Tate's Cairn Weather Radar Station (TCWRS) for enhancing education, training, calibration and maintenance of the radar system.

LOCATION

Tate's Cairn Weather Radar Station

SCHEDULED TIME OF COMPLETION

Around 8 months from January to August 2019

Using BIM to support radar system operation



About Hong Kong Observatory, HKSAR Government

The Hong Kong Observatory (HKO) is the official meteorological authority in Hong Kong, responsible for monitoring and forecasting weather, and issuing warnings on weather-related hazards. The Observatory also monitors and assesses radiation levels in Hong Kong, and provides other meteorological and geophysical services to meet the needs of the public and the shipping, aviation, industrial and engineering sectors. The Observatory's vision is to be a model of excellence in protecting lives and building together a better society through science.

The Observatory currently operates two long-range Doppler weather radars at Tai Mo Shan and Tate's Cairn respectively for monitoring inclement weather such as rainstorms and tropical cyclones. The existing radar at Tate's Cairn is the fifth radar installed at the site and the first one was installed in 1959. It is also the first dual-polarisation Doppler weather radar installed in Hong Kong, capable of monitoring hail and rainfall rates.

BIM PARTNER

isBIM Ltd

AUTODESK PRODUCTS USED

A360

BIM 360 Glue

Navisworks

Revit

Project Description

A weather radar is a highly complex system comprising many electronic and mechanical components. Some are embedded items and it is impractical to retrieve them for visualization. This poses difficulty to train maintenance staff to understand radar operation including the functions of various components, cable connections between different radar equipment and the flow of radar signals. The BIM model helps to resolve the above problems, allowing greater flexibility and enhancing efficiency in conducting staff training and radar maintenance.

Project Challenges

A weather radar comprises many specialized mechanical and electronic components. Different operational procedures in handling these components are involved in performing maintenance. The BIM project for TCWRS needed to cover these procedures which made the development task very challenging. Also, the project was rather pioneering in nature as there was little reference of applying BIM technology to support radar operation and maintenance. With a lack of BIM experience, HKO had to devise project objectives so that the BIM model developed could be used for meeting a multitude of operational needs.

Solutions for challenges

Both the HKO management and front-line radar maintenance staff coordinated closely in formulating the detailed requirements of the BIM. Many photos, drawings and technical documentation of the radar system were pulled together and conveyed to the modellers for developing the BIM model. As some technical aspects of radar operation such as transmission of radar pulses were difficult to be visualized via 2-D photos and drawings while the BIM contractor did not have the relevant professional knowledge, the BIM development had to go through many iterations so that the model could be made correct to the satisfaction of HKO.

How does BIM benefit the project?

The BIM model enabled easy understanding of radar operation. Through graphical simulations, a 3-dimensional perspective could be provided for HKO staff to appreciate the process of performing maintenance such as replacement of embedded critical component which was not conducted regularly. The BIM provided an effective and flexible way of training maintenance staff without the necessity of going to the radar site and switching off the radar to conduct training. The latter would generate downtime and affect the real-time radar operation. The BIM also helped to assess risk when planning to perform installation of various radar equipment or station facilities.

Better with BIM

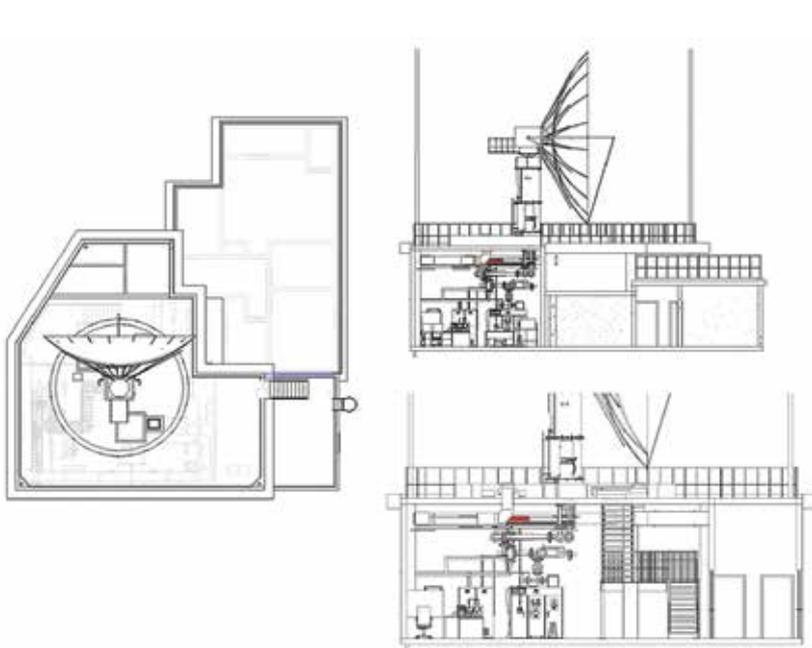
In addition to enhancing staff training and operational maintenance, the BIM provided a more realistic virtual tour of the TCWRS. Visitors could virtually walkthrough the TCWRS and visualize from a 3-dimensional perspective the different functions and components of a radar system for gaining a better understanding of radar operation. HKO staff and other contractors could familiarize themselves quickly with the radar site environment when planning for site works. As the expected lifespan of a radar was over 15 years, the BIM developed for the TCWRS was a useful asset to HKO for continual improvement of radar maintenance and station management.



The BIM model of TCWRS. Figure inset shows the equipment room setting inside TCWRS. Image Courtesy of Hong Kong Observatory, HKSAR Government



Simulation of radar pulse transmission, flow of radar signal and product generation. Image Courtesy of Hong Kong Observatory, HKSAR Government



Plan and elevation views of TCWRS exported from the project BIM model. Image Courtesy of Hong Kong Observatory, HKSAR Government



Performance specifications of critical radar equipment embedded in the BIM model. Image Courtesy of Hong Kong Observatory, HKSAR Government



HKO staff conducted in-house training on radar maintenance procedures. Image Courtesy of Hong Kong Observatory, HKSAR Government