

What Are The HKSAR Government's Current Directives For BIM Development?

From 2013 onwards, the HKSAR Government (the Government) has adopted an incremental strategy for the use of Building Information Modeling (BIM) in public works projects. The following Technical Circulars have been issued by the Development Bureau to accommodate the progressive implementation of BIM in the construction industry in Hong Kong:

DEVB TC(W) No. 7/2017	This technical circular ¹ requires consultants and contractors to adopt BIM in the design of major Government Capital Works Projects (2018 onwards).
DEVB TC(W) No. 18/2018	This technical circular ² mandates some BIM uses relating to construction planning (4-D) and cost estimation (5-D) to promote wider use of BIM.
DEVB TC(W) No. 9/2019	This technical circular ³ extends the scope of mandatory BIM uses in investigation, feasibility and planning stage, design for digital fabrication as well as sustainability evaluation (6-D).
DEVB TC(W) No. 12/2020	This technical circular ⁴ further extends the scope of mandatory BIM uses to asset management, surveying of underground utilities, engineering analysis, 3-D control, and planning.
DEVB TC(W) No. 2/2021	This technical circular ⁵ Enhances the BIM workflow, requirements of Common Data Environment (CDE), BIM data harmonisation and security.

¹ Development Bureau Technical Circular DEVB TC(W) No. 7/2017 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong: <https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/354/1/C-2017-07-01.pdf>

² Development Bureau Technical Circular DEVB TC(W) No. 18/2018 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong: <https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/366/1/C-2018-18-01.pdf>

³ Development Bureau Technical Circular DEVB TC(W) No. 9/2019 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong: <https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/371/1/C-2019-09-01.pdf> <https://www.ubs.com/global/en/assetmanagement/insights/thematic-viewpoints/apac-and-emerging/articles/china-three-red-lines.html>

⁴ Development Bureau Technical Circular DEVB TC(W) No. 12/2020 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong: <https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/381/1/C-2020-12-01.pdf>

⁵ Development Bureau Technical Circular DEVB TC(W) No. 2/2021 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong: <https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/387/1/C-2021-02-01.pdf>

What Are The Current Applications of BIM Modelling?

Design Stage – Design Management

It is a common practice for design consultants to build the corresponding models through the application of 3D design software.

Autodesk Revit is an example of such application. It is a BIM modelling software for architects, landscape architects, interior designers, structural engineers, mechanical, electrical, and plumbing (MEP) engineers and contractors. The software allows users to create and design a building and structure and its components in 3D, annotate the model with 2D drafting elements, and access building information from the building model's database⁶.

For the ease of collaboration, it is recommended to share the BIM models in a Common Data Environment (CDE) for BIM models' exchange, changes tracking, and quick model viewing/ annotating⁷ (Angela & Joan, n.d.). The use of CDE is also promoted in DEVB TC(W) No. 2/2021.

The models created in the design stage can be used for different types of analysis to validate the design, such as Structural Analysis⁸, Crowd Control Simulation⁹, Computational Fluid Analysis for Fire Engineering¹⁰ and may other similar forms of analysis.

Construction Stage - 4D Planning/ 3D Progress Markup for Progress Monitoring

4D planning are widely adopted by the industry to visualise the construction process by bridging the programme and the 3D model. One of the benefits is that a complex programme can be summarised in a short video, which gives the project stakeholders a better sense of understanding of the project¹¹.

In my personal experience in a construction project, the BIM model can also be marked up to show the progress

of construction and to identify the upcoming works, which provides a very useful record and measurement of progress. For example, for excavation works, volumetric analysis can be performed to quantify the amount of excavation carried out at a particular point in the project.

These, and other similar functions allow users to perform quick and insightful analysis to better understand the project as the work progresses.

Post-Handover Stage – Facility Management (FM)

Photogrammetry is a method of 3D scanning based on images or videos, which is gaining popularity with certain mobile devices having LiDAR sensors such as the Apple iPhone 12 and 13 Pro.

LiDAR, stands for Light Detection and Ranging, is a technology to measure distance with laser, which is used to measure the profile of an inspected object or environment. This technology makes 3D scanning easily accessible to a wider range of users¹². An increasing number of contractors are now using 3D scanning for preparing records in the construction industry.

The same technology is particularly useful for the planning and carrying out of maintenance work under FM applications, as the 3D as-built information allows Facilities Managers to understand the building conditions and assist in the facilitation of the maintenance process quickly and easily¹³.

How Can These Technologies Potentially Improve Quantum And Delay Analysis?

Often, quantum and delay analysis are related to changes that occur during the construction process which cause delay to, or disruption of the construction programme and the work carried out on site¹⁴.

⁶Wikipedia - Autodesk Revit: https://en.wikipedia.org/wiki/Autodesk_Revit

⁷Autodesk University - ISO 19650, the Common Data Environment, and Autodesk Construction Cloud: [https://www.autodesk.com/autodesk-university/article/ISO-19650-Common-Data-Environment-and-Autodesk-Construction-Cloud-2021#:~:text=E2%80%9CThe%20common%20data%20environment%20\(CDE,%2C%E2%80%9D%20says%20the%20BIM%20Wiki.](https://www.autodesk.com/autodesk-university/article/ISO-19650-Common-Data-Environment-and-Autodesk-Construction-Cloud-2021#:~:text=E2%80%9CThe%20common%20data%20environment%20(CDE,%2C%E2%80%9D%20says%20the%20BIM%20Wiki.)

⁸Autodesk - BIM for structural engineering: <https://www.autodesk.com/industry/aec/bim/structural-engineering#:~:text=What%20is%20BIM%20for%20structures,document%2C%20and%20fabricate%20structural%20systems.>

⁹BIM Today - Using BIM to enhance 3D crowd simulation – and vice versa: <https://www.pbctoday.co.uk/news/bim-news/using-bim-enhance-3d-crowd-simulation-vice-versa/34527/>

¹⁰Autodesk - Taking Advantage of BIM for CFD Modeling: <https://www.autodesk.com/industry/aec/bim/structural-engineering#:~:text=What%20is%20BIM%20for%20structures,document%2C%20and%20fabricate%20structural%20systems.>

¹¹DTU - 4D-Planning in Construction Management: http://apppm.man.dtu.dk/index.php/4D-Planning_in_Construction_Management.

¹²Wikipedia – LiDAR: <https://en.wikipedia.org/wiki/Lidar>

¹³ResearchGate - Combining Photogrammetry and Augmented Reality Towards an Integrated Facility Management System for the Oil Industry: https://www.researchgate.net/publication/260722677_Combining_Photogrammetry_and_Augmented_Reality_Towards_an_Integrated_Facility_Management_System_for_the_Oil_Industry.

¹⁴Lexology - Delay and Quantum: the Role of Delay Analysis Programmes and Financial Methods for the Computation of Costs and Damages in Construction Arbitration: <https://www.lexology.com/library/detail.aspx?g=e26df642-6112-459b-bb38-f452b7a8164d>

With a BIM model, change comparison can be easily performed¹⁵. The affected construction elements can be highlighted and quantified efficiently. At the same time, the affected construction activities can also be determined. This application can greatly improve and speed up the process of quantum and delay analysis by efficiently identifying the impact of changes on the work.

With the computational aid, the change analysis can be performed significantly quicker and more accurately than was previously possible.

Moving Forward

The current advancing development of BIM applications is encouraging and full of opportunities for practitioners to harness the power of the software and apply it in a practical way to everyday construction problem. The development of BIM applications should greatly assist in the analysis of changes on projects to facilitate the preparation of more accurate extension of time, disruption, and cost claims in a significantly shorter timeframe.

Practitioners across the construction industry would be well advised to keep abreast of the rapid development of BIM model applications given the considerable potential for improving the way we undertake our work.

¹⁵ DAutodesk Knowledge – Compare Changes: <https://knowledge.autodesk.com/search-result/caas/CloudHelp/cloudhelp/ENU/BIM360D-Design-Collaboration/files/About-Changes-in-Design/About-Change-Workflows/GUID-D4DF5D59-53EE-4C3A-A8AB-ADF85686BAD8-html.html>

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