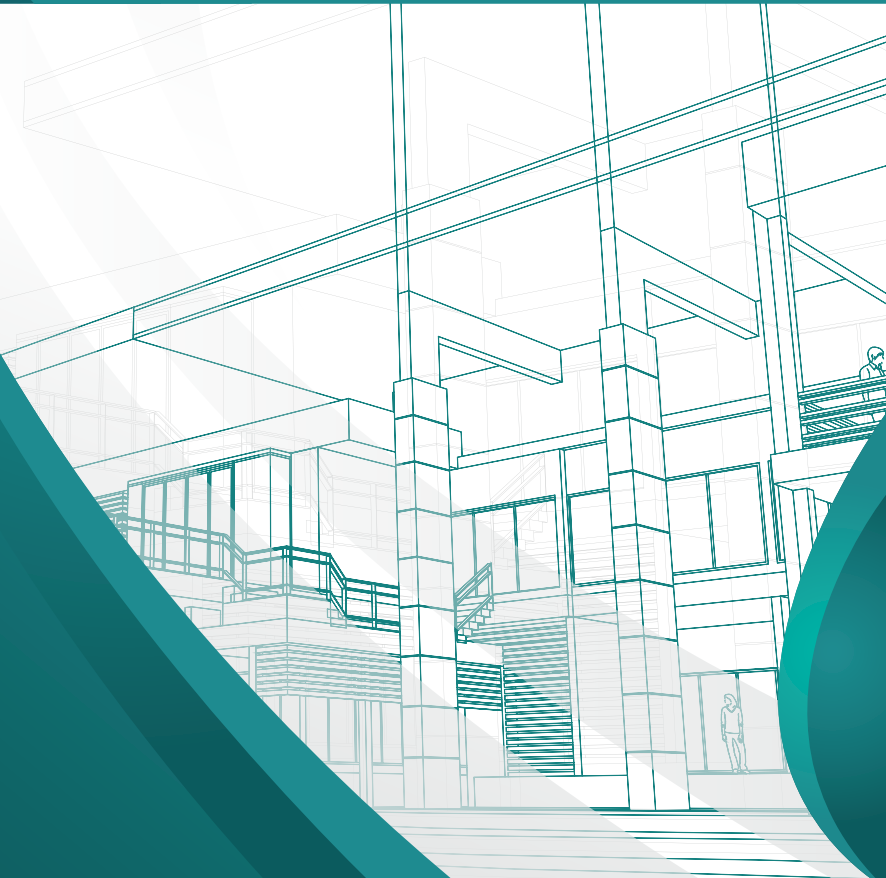


MIGRATION FROM CONVENTIONAL CONSTRUCTION METHODS TO IBS IN THE MALAYSIAN CONSTRUCTION INDUSTRY

**MIGRASI DARIPADA PROJEK PEMBINAAN KONVENSIONAL
KEPADA PROJEK PEMBINAAN IBS**





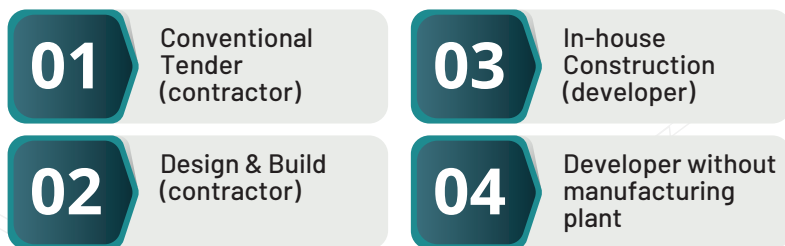
MIGRATION FROM CONVENTIONAL CONSTRUCTION METHODS TO IBS IN THE MALAYSIAN CONSTRUCTION INDUSTRY

ENGLISH

This set of guidelines are drawn up to assist industry players in the process of migrating from conventional construction methods to Industrialised Building System (IBS) construction. The layout of this guidelines has been structured based on five (5) stages, namely planning stage, tender stage (for contractor), design stage, construction stage, and post-construction stage.



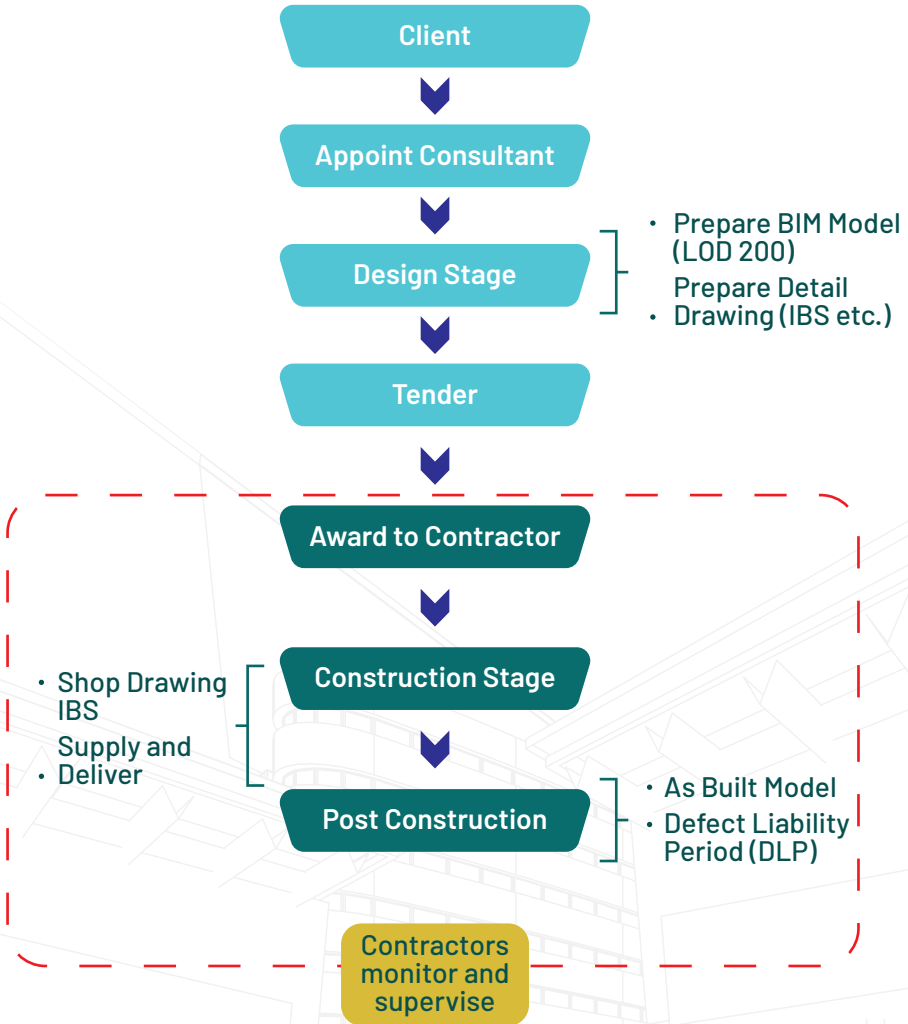
The workflow in IBS construction is divided into four categories which are conventional tender (contractor), Design & Build tender (contractor), in-house construction (developer), and developer without manufacturing plant.



To start up the IBS business, the implementers should make early preparations. In the planning stage, the items that need to be taken into consideration are as follows:

- i. To have a strong financial background
- ii. To select a suitable IBS system / depending on the availability of materials
- iii. To ensure the availability of nearest manufacturer and supplier
- iv. To prepare the site logistics for the IBS components and materials
- v. To train the workforce in accordance with IBS syllabus
- vi. To conduct market survey / cost-benefit analysis (CBA) / business plan
- vii. To have knowledge on Building Information Modelling (BIM)
- viii. To register for IMPACT / Technical Opinion Program with CIDB

CONVENTIONAL TENDER



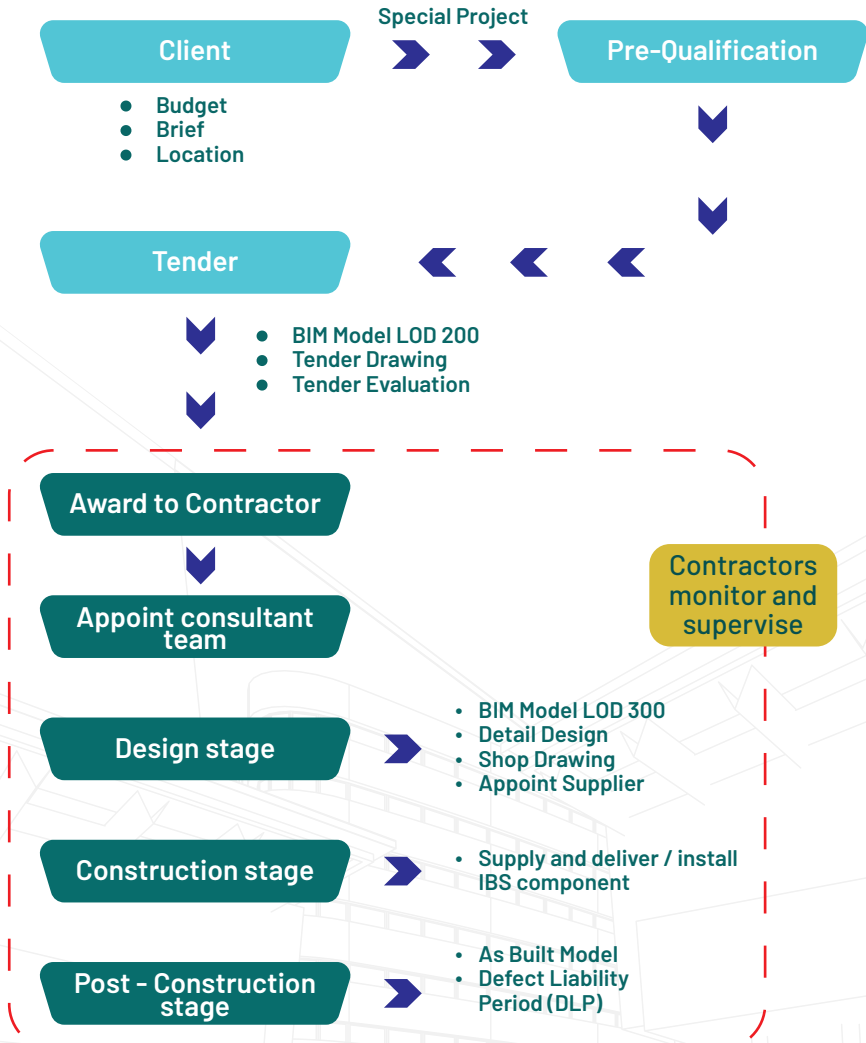
Flow of Work of Conventional Tender for Contractors

The workflow starts from the client who will award the IBS project. The client in this context can be the developer or the government. Next, the client will appoint the consultant. During the design stage, the BIM Model is prepared with Level of Development (200) together with a detailed drawing. The consultant will ensure that the IBS drawing prepared complies with the requirement of IBS score imposed by the client / government.

Then, the tender stage begins. This stage includes the involvement of contractors afterwards. In this workflow, the tender is a conventional tender. Implementation of conventional tender is a responsibility shared by owners, designers, and contractors, requiring effective coordination and communication. The contractor will monitor and supervise the project implementation until the end of the project. During the construction stage, the contractors are required to prepare a shop drawing for IBS, while the manufacturer should supply and deliver IBS materials. The construction stage is known as the performing phase where the project plan is executed, and work tasks are carried out to accomplish project deliverables and project objectives. Shop drawings are required for components and products that must typically be made off-site. The need for shop drawings for certain items arises because the construction drawings do not describe the items to a level of detail that would make their fabrication possible.

The post-construction stage involves a specific time period known as the Defect Liability Period (LDP). During the DLP, the contractors are responsible to repair defective or damaged products after construction is completed. The DLP starts from the date the CPC is issued until the expiry of the DLP period as specified in the contract. The scope of client or developer activities at the DLP level includes the process of monitoring work. CIDB has introduced Quality Assessment System in Construction (QLASSIC) to ensure that the quality of workmanship meets the minimum standards.

DESIGN & BUILD TENDER



Flow of Work of Design & Build Tender for Contractors

For Design & Build tender, the client will award special project through pre-qualification. Client will do a briefing session which will cover the budget and the location of the project. After the pre-qualification session, the tender will be awarded to the selected contractor. During the tender stage, the BIM Model Level of Development (LOD) 200 tender drawing is required. Subsequently, the client will evaluate the tender submission according to the criteria and requirements as imposed by the client.

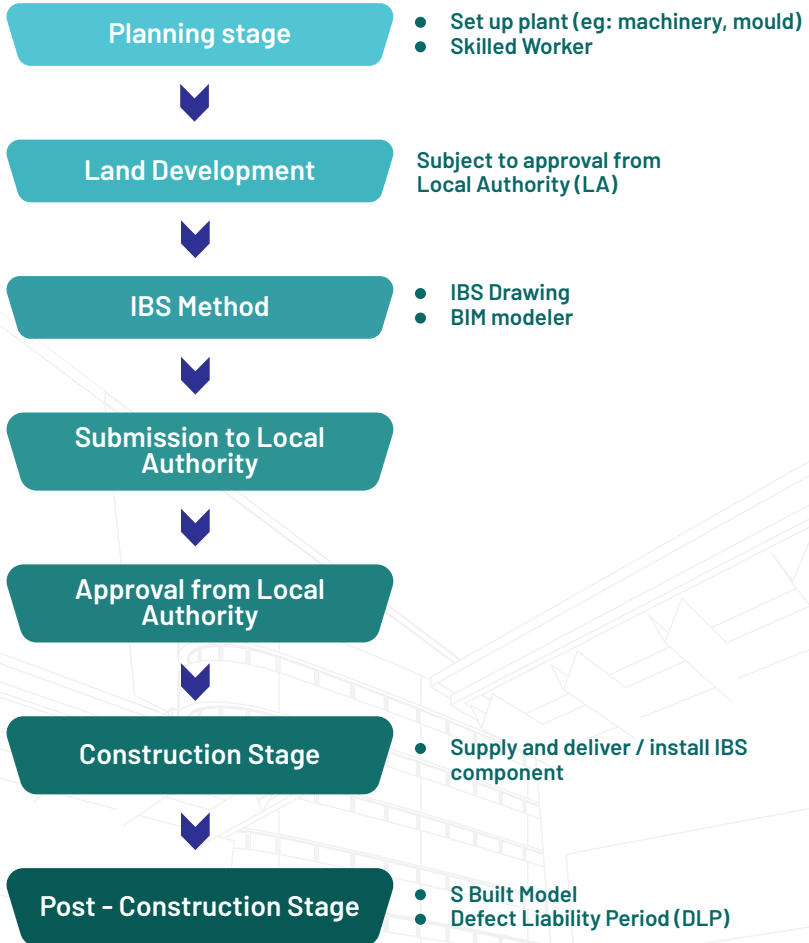
Then, the selected contractor will appoint the consultant team which specialises in IBS. After the appointment of the consultant, the contractor will continue to monitor and supervise the process until the end of the project. During the design stage, the BIM model LOD 300, detailed designs and shop drawings are required. The supplier is appointed during this stage to supply and deliver IBS components later. Shop drawings are required for components and products that must typically be made off-site. The need for shop drawings for certain items arises because the construction drawings do not describe them to a level of detail that makes their fabrication possible.

The installation of IBS component starts during the construction stage. The construction stage is known as the performing phase where the project plan is executed, and work tasks are carried out to accomplish project deliverables and project objectives.

The last stage is the post-construction stage which similarly involves the Defect Liability Period (DLP). During the DLP, the contractors are responsible to repair defective or damaged products after construction is completed. The DLP starts from the date the CPC is issued until the expiry of the DLP period as specified in the contract. The scope of client or developer activities at the DLP level includes the process of monitoring work. CIDB has introduced Quality Assessment System in Construction (QLASSIC) to ensure that the quality of workmanship meets the minimum standards.

IN-HOUSE CONSTRUCTION

(Developer + Contractor + Supplier)



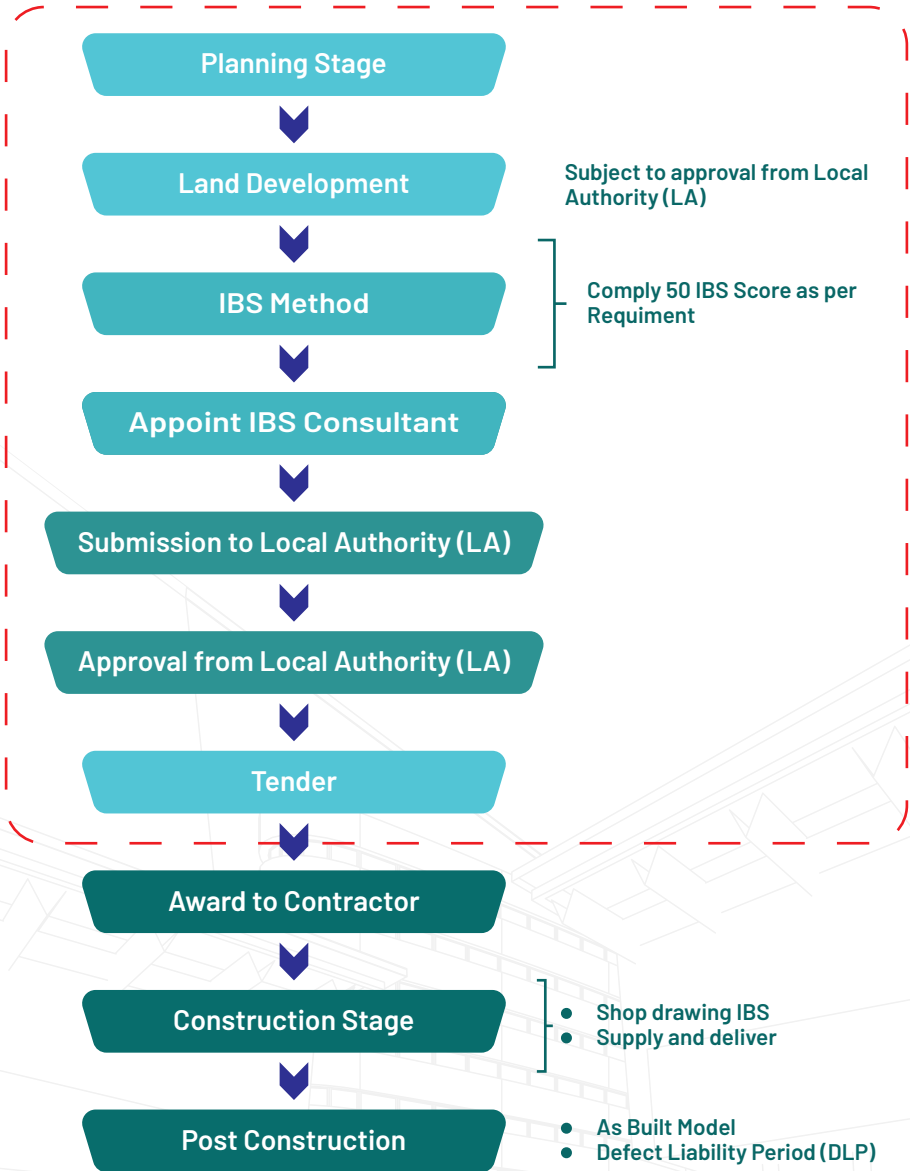
Flow of Work of In-House Construction for Developers / Clients

The workflow of in-house construction for developers or clients starts from the planning stage. During the planning stage, a lot of factors need to be taken into consideration. It is necessary to have a strong financial background at an early stage in order to set up a manufacturing plant, to create mould, to hire skilled workers, to buy machineries and many more. In addition, the developer should select a suitable IBS system and available materials depending on the location and the budget of the project. To select a suitable IBS system, it is essential to ensure the availability of the nearest manufacturer and supplier. The business plan, Cost Benefit Analysis (CBA), and market survey should be done before any business starts. Moreover, it is an added value if the developers and related parties have at least some knowledge of Building Information Modelling (BIM).

After the planning stage, approval from the Local Authority (LA) for land development purposes is required. Then, it should be decided that the IBS method is to be used for construction. The IBS drawing and BIM modeler should be prepared once the method have been decided upon, for the purpose of submission to the LA.

Once approval from the LA is granted, the construction stage can commence. The installation of IBS component begins during the construction stage which is known as the performing phase where the project plan is executed, and work tasks are carried out to accomplish project deliverables and project objectives.

The last stage, namely the post-construction stage, involves the Defect Liability Period (DLP). During the DLP, the contractors are responsible to repair defective or damaged products after the construction is completed. The DLP activities can be carried out from the date the CPC is issued until the expiry of the DLP period as specified in the contract. The scope of client or developer activities at the DLP level covers the process of monitoring work. CIDB has introduced the Quality Assessment System in Construction (QLASSIC) to ensure that the quality of workmanship meets the minimum standards.



Flow of Work for Developers without a Manufacturing Plant

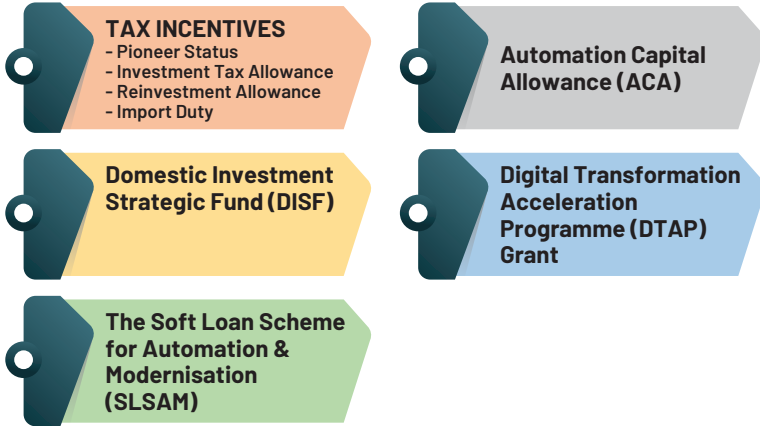
The workflow for developers without a manufacturing plant starts from the planning stage until the tender stage. During the planning stage, a lot of factors need to be taken into consideration. It is necessary to have a strong financial background at an early stage in order to set up a manufacturing plant, to create mould, to hire skilled workers, to buy machineries and many more. In addition, the developer should select a suitable IBS system and available materials depending on the location and the budget of the project. To select a suitable IBS system, it is essential to ensure the availability of the nearest manufacturer and supplier. The business plan, Cost Benefit Analysis (CBA) and market survey should be done before any business starts. Moreover, it is an added value if the developers and related parties have at least some knowledge of Building Information Modelling (BIM).

After the planning stage, approval from the Local Authority (LA) for land development purposes is required. Then, it should be decided that the IBS method shall be used for construction. The IBS drawing and BIM modeler should be prepared once the method have been decided upon, for the purpose of submission to the LA.

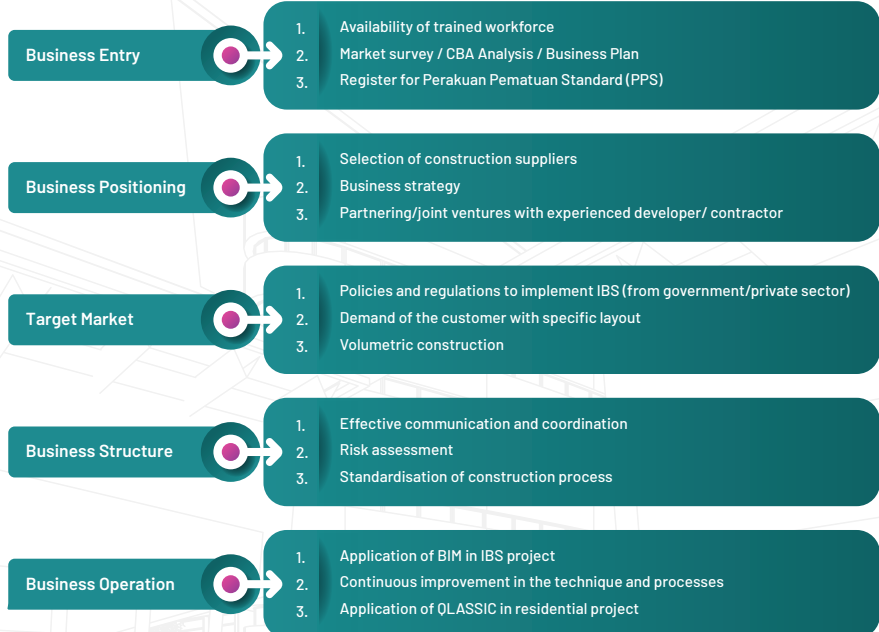
Once the approval from the LA is granted, the tender stage can commence. The selected contractor can start the construction process afterwards. During the construction stage, the shop drawing IBS and the supply and delivery of IBS components should be done.

The last stage is the post-construction stage which involves the Defect Liability Period (DLP). During the DLP, the contractors are responsible to repair defective or damaged products after the construction is completed. The DLP activities can be carried out from the date the CPC is issued until the expiry of the DLP period as specified in the contract. The scope of client or developer activities at the DLP level covers the process of monitoring work. CIDB has introduced the Quality Assessment System in Construction (QLASSIC) to ensure that the quality of workmanship meets the minimum standards.

IBS INCENTIVES TO THE ADOPTERS



IBS BUSINESS MODEL

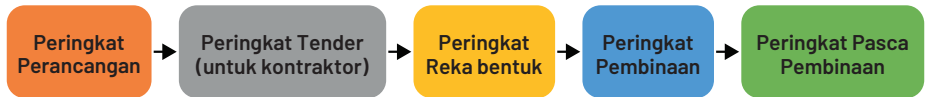




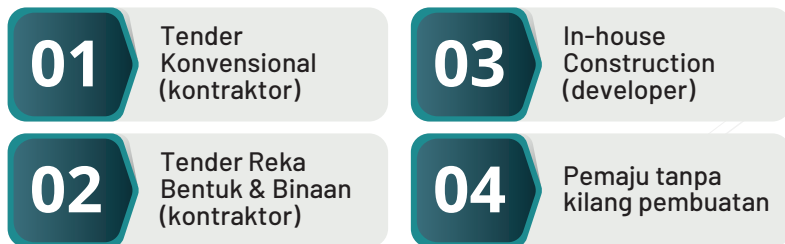
MIGRASI DARIPADA PROJEK PEMBINAAN KONVENSIONAL KEPADA PROJEK PEMBINAAN IBS

BAHASA MELAYU

Garis panduan ini bertujuan untuk membantu pemain industri bagi proses migrasi daripada pembinaan konvensional ke IBS. Susun atur garis panduan ini akan berdasarkan lima (5) peringkat iaitu peringkat perancangan, peringkat tender (untuk kontraktor), peringkat reka bentuk, peringkat pembinaan, dan peringkat pasca pembinaan.



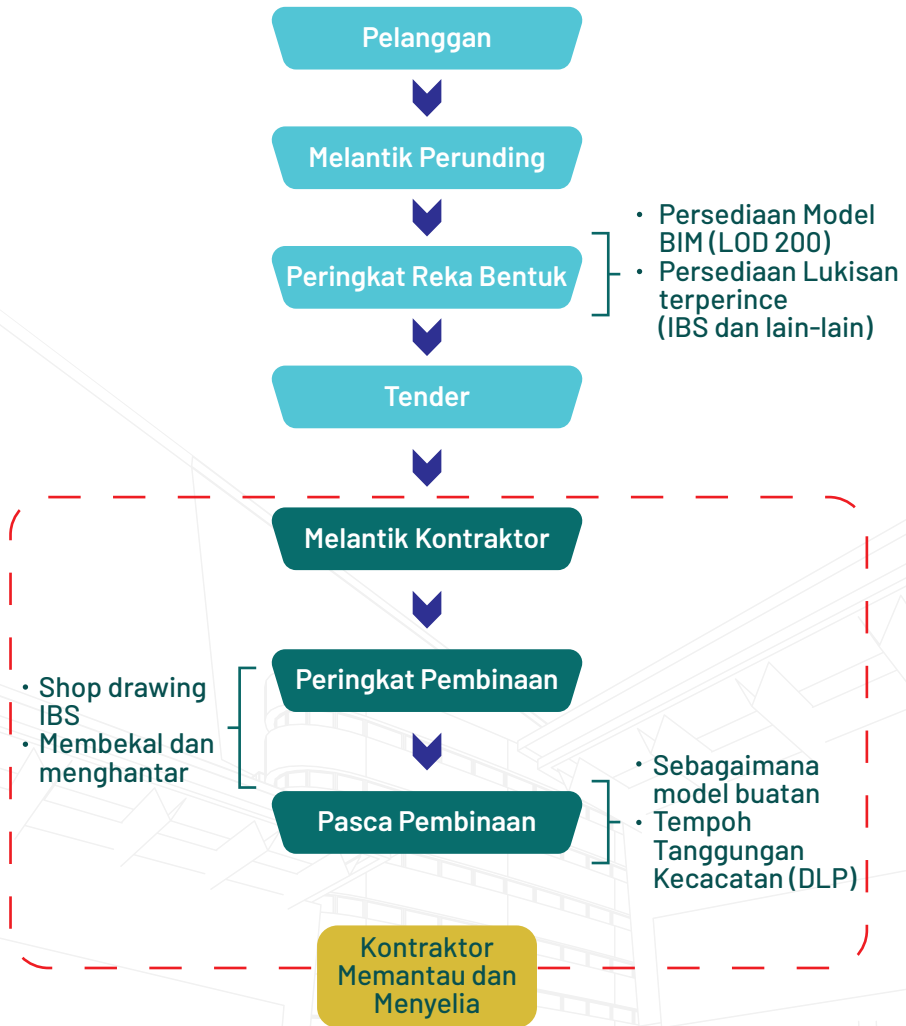
Aliran kerja pembinaan IBS terbahagi kepada empat kategori iaitu tender konvensional (kontraktor), tender Reka Bentuk & Binaan (kontraktor), pembinaan in-house (pemaju), dan pemaju tanpa kilang pembuatan.



Untuk memulakan perniagaan IBS, pelaksana harus membuat persiapan awal. Pada peringkat perancangan, perkara yang perlu dipertimbangkan adalah seperti berikut:

- i. Mempunyai latar belakang kewangan yang kukuh
- ii. Memilih sistem IBS / ketersediaan bahan yang sesuai
- iii. Memastikan terdapat pengeluar dan pembekal terdekat
- iv. Menyediakan logistik untuk komponen dan bahan IBS
- v. Melatih tenaga kerja mengikut sukatan pelajaran IBS
- vi. Melakukan tinjauan pasaran / Analisis Manfaat Kos (CBA) / Rancangan Perniagaan
- vii. Mempunyai pengetahuan mengenai Building Information Modelling (BIM)
- viii. Mendaftar bagi program IMPACT / Technical Opinion Program dengan CIDB

TENDER KONVENSIONAL



Aliran Kerja Tender Konvensional untuk Kontraktor

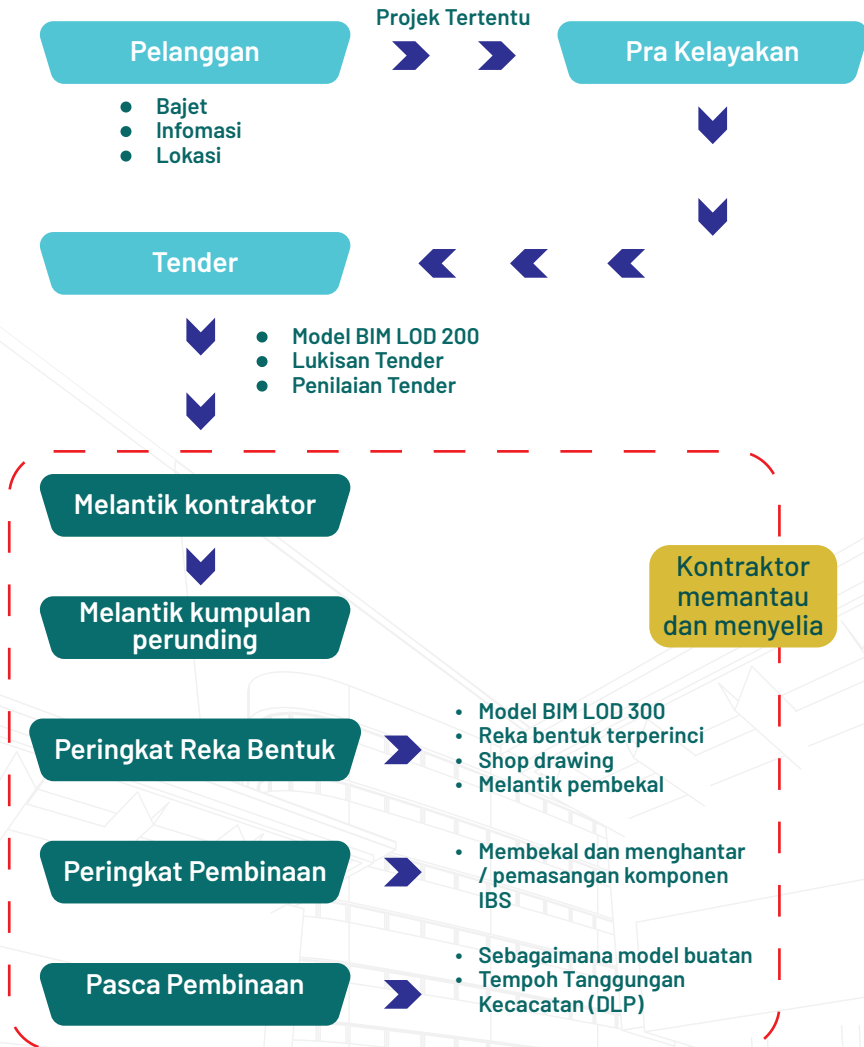
Aliran kerja ini bermula daripada pelanggan yang akan memberikan projek IBS. Pelanggan dalam konteks ini boleh jadi pemaju atau kerajaan. Seterusnya, pelanggan akan melantik perunding. Pada peringkat reka bentuk, Model BIM disediakan berserta Tahap Pembangunan (200) dan gambar terperinci. Perunding akan menyiapkan lukisan IBS untuk memenuhi syarat skor IBS daripada pelanggan / kerajaan.

Kemudian, peringkat tender bermula yang merangkumi penglibatan kontraktor selepas itu. Dalam aliran kerja ini, tender yang digunakan ialah tender konvensional. Tanggungjawab pelaksanaan tender konvensional dikongsi oleh pemilik, pereka, dan kontraktor dan ia memerlukan koordinasi dan komunikasi yang berkesan.

Kontraktor akan memantau dan menyelia pelaksanaan projek sehingga akhir projek. Semasa peringkat pembinaan, kontraktor diminta menyiapkan shop drawing untuk IBS. Pengilang perlu membekalkan dan menghantar bahan IBS pada peringkat ini. Peringkat pembinaan dikenali sebagai fasa pelaksanaan di mana rancangan projek dilaksanakan dan tugas-tugas kerja dilakukan untuk mencapai objektif projek. Shop drawing diperlukan bagi komponen dan produk yang biasanya dibuat di luar tapak bina. Keperluan shop drawing adalah untuk mengelakkan isu lukisan pembinaan tidak menggambarkan komponen dan produk secara terperinci.

Peringkat pasca pembinaan melibatkan Tempoh Tanggungan Kecacatan (DLP). Sepanjang DLP, kontraktor bertanggungjawab untuk menjaga atau memperbaiki kecacatan atau kerosakan produk setelah pembinaan selesai. Pelaksanaan DLP bermula dari tarikh CPC dikeluarkan hingga tarikh akhir tempoh DLP seperti yang ditetapkan dalam kontrak. Skop aktiviti pelanggan atau pemaju pada peringkat DLP merangkumi proses kerja pemantauan. CIDB telah memperkenalkan Sistem Penilaian Kualiti dalam Pembinaan (QLASSIC) untuk memastikan kualiti pembuatan mencapai standard minimum.

TENDER REKA BENTUK & BINA



Aliran Kerja Tender Reka Bentuk & Bina untuk Kontraktor

Bagi tender reka bentuk & bina, pelanggan akan melantik kontraktor bagi projek tertentu melalui pra-kelayakan. Pelanggan akan melakukan sesi taklimat, pemberitahuan bajet, dan lokasi projek. Selepas sesi pra-kelayakan, lantikan kontraktor dibuat melalui tender. Pada peringkat tender, Model BIM LOD 200, lukisan tender diperlukan. Pelanggan akan menilai penyerahan tender mengikut kriteria dan keperluan projek.

Kemudian, lantikan kontraktor bermula untuk pelaksanaan projek. Seterusnya, kontraktor akan melantik perunding IBS. Selepas lantikan perunding, kontraktor akan memantau dan menyelia proses pembinaan sehingga siap. Pada peringkat reka bentuk, Model BOM LOD 300, reka bentuk terperinci dan shop drawing diperlukan. Shop drawing diperlukan untuk komponen dan produk yang biasanya dibuat di luar tapak bina. Keperluan shop drawing adalah untuk mengelakkan isu lukisan pembinaan tidak menggambarkan item dan produk secara terperinci.

Pemasangan komponen IBS bermula pada peringkat pembinaan. Peringkat pembinaan dikenali sebagai fasa pelaksanaan di mana rancangan projek dilaksanakan dan tugas-tugas kerja dilakukan untuk mencapai objektif projek.

Peringkat pasca pembinaan melibatkan Tempoh Tanggungan Kecacatan (DLP). Semasa DLP, kontraktor bertanggungjawab untuk menjaga atau memperbaiki kecacatan atau kerosakan produk setelah pembinaan selesai. Pelaksanaan DLP bermula dari tarikh CPC dikeluarkan hingga tarikh akhir tempoh DLP seperti yang ditetapkan dalam kontrak. Skop aktiviti pelanggan atau pemaju pada peringkat DLP merangkumi proses kerja pemantauan. CIDB telah memperkenalkan Sistem Penilaian Kualiti dalam Pembinaan (QLASSIC) untuk memastikan kualiti pembuatan mencapai standard minimum.

IN-HOUSE CONSTRUCTION

(Pemaju + Kontraktor + Pembekal)



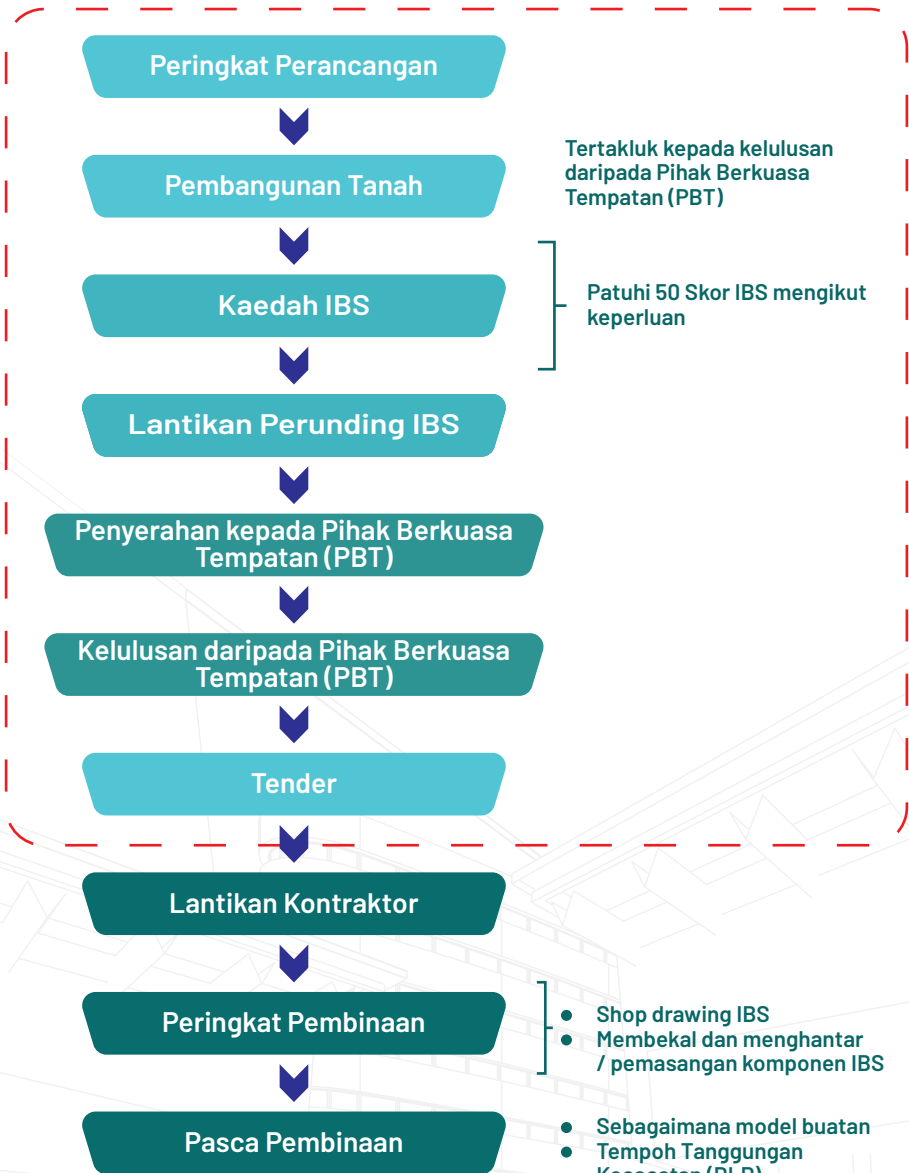
Aliran Kerja In-House Construction untuk Pemaju / Pelanggan

Aliran kerja bagi in-house construction untuk pemaju dan pelanggan bermula dengan peringkat perancangan. Semasa peringkat perancangan banyak pertimbangan harus diambil kira. Latar belakang kewangan yang kuat adalah penting pada peringkat awal bagi tujuan mendirikan kilang pembuatan, membuat acuan, mengambil pekerja mahir, membeli mesin dan banyak lagi. Selain itu, pemaju harus memilih sistem IBS yang sesuai dan memastikan ketersediaan bahan berdasarkan lokasi dan anggaran projek. Bagi pemilihan sistem IBS yang sesuai, ketersediaan pengeluar dan pembekal yang terdekat perlu dipastikan. Rancangan perniagaan, Analisis Manfaat Kos (CBA), dan tinjauan pasaran harus dilakukan sebelum perniagaan dimulakan. Di samping itu, pengetahuan pemaju dan pihak berkaitan tentang Building Information Modeling (BIM) menjadi nilai tambah pada peringkat ini.

Selepas peringkat perancangan, persetujuan daripada Pihak Berkuasa Tempatan (PBT) diperlukan bagi tujuan pembangunan tanah. Seterusnya, keputusan perlu dibuat untuk menggunakan kaedah IBS sebagai kaedah pembinaan. Kemudian lukisan IBS dan pemodel BIM perlu disiapkan bagi tujuan penyerahan kepada PBT.

Setelah mendapat kelulusan daripada pihak PBT, peringkat pembinaan dapat dimulakan. Pemasangan komponen IBS dimulakan pada peringkat ini. Peringkat pembinaan dikenali sebagai fasa pelaksanaan di mana rancangan projek dilaksanakan dan tugas-tugas kerja dilakukan untuk mencapai objektif projek.

Peringkat pasca pembinaan melibatkan Tempoh Tanggungan Kecacatan (DLP). Sepanjang DLP, kontraktor bertanggungjawab untuk menjaga atau memperbaiki kecacatan atau kerosakan produk setelah pembinaan selesai. Pelaksanaan DLP bermula dari tarikh CPC dikeluarkan hingga tarikh akhir tempoh DLP seperti yang ditetapkan dalam kontrak. Skop aktiviti pelanggan atau pemaju pada peringkat DLP merangkumi proses kerja pemantauan. CIDB telah memperkenalkan Sistem Penilaian Kualiti dalam Pembinaan (QLASSIC) untuk memastikan kualiti pembuatan mencapai standard minimum.



Aliran Kerja bagi Pemaju tanpa Kilang Pembuatan

Aliran kerja bagi pemaju tanpa kilang pembuatan bermula daripada peringkat perancangan sehingga peringkat tender. Semasa peringkat perancangan banyak pertimbangan harus diambil kira. Latar belakang kewangan yang kuat adalah penting pada peringkat awal bagi tujuan mendirikan kilang pembuatan, membuat acuan, mengambil pekerja mahir, membeli mesin dan banyak lagi. Selain itu, pemaju harus memilih sistem IBS yang sesuai dan memastikan ketersediaan bahan berdasarkan lokasi dan anggaran projek. Bagi pemilihan sistem IBS yang sesuai, ketersediaan pengeluaran dan pembekal yang terdekat perlu dipastikan. Rancangan perniagaan, Analisis Manfaat Kos (CBA), dan tinjauan pasaran harus dilakukan sebelum perniagaan dimulakan. Di samping itu, pengetahuan pemaju dan pihak berkaitan tentang Building Information Modeling (BIM) menjadi nilai tambah pada peringkat ini.

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Setelah mendapat kelulusan daripada pihak PBT, peringkat tender dapat dimulakan. Kontraktor yang terpilih dapat memulakan proses pembinaan selepas itu. Pada peringkat pembinaan, kontraktor perlu membuat shop drawing dan pembekalan dan penyerahan komponen IBS harus dilakukan pada peringkat ini.

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INSENTIF KEPADA PELAKSANA IBS



MODEL PERNIAGAAN IBS





Owned by/ Hak Milik:

CIDB Malaysia

Construction Technology & Innovation Division

Bahagian Teknologi Binaan & Inovasi

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