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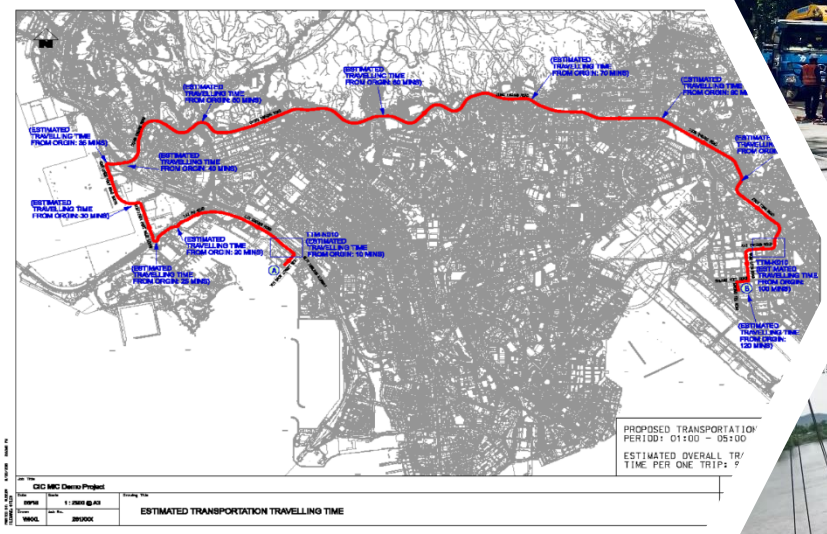

Reference Materials - Logistics and Transport for MiC Projects

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PREFACE

The Construction Industry Council (CIC) is committed to seeking continuous improvement in all aspects of the construction industry in Hong Kong. To achieve this aim, the CIC forms Committees, Task Forces and other forums to review specific areas of work with the intention of producing Alerts, Reference Materials, Guidelines and Codes of Conduct to assist participants in the industry to strive for excellence.

The CIC appreciates that some improvements and practices can be implemented immediately whilst others may take more time for implementation. It is for this reason that four separate categories of publication have been adopted, the purposes of which are as follows:

Alerts	The Alerts are reminders in the form of brief leaflets produced quickly to draw the immediate attention of relevant stakeholders to the need to follow some good practices or to implement some preventive measures in relation to the construction industry.
Reference Materials	The Reference Materials are standards or methodologies generally adopted and regarded by the industry as good practices. The CIC recommends the adoption of the Reference Materials by industry stakeholders where appropriate.
Guidelines	The Guidelines provide information and guidance on particular topics relevant to the construction industry. The CIC expects all industry stakeholders to adopt the recommendations set out in the Guidelines where applicable.
Codes of Conduct	The Codes of Conduct set out the principles that all relevant industry participants should follow. Under the Construction Industry Council (Cap 587), the CIC is tasked to formulate codes of conduct and enforce such codes. The CIC may take necessary actions to ensure compliance with the codes.

If you have read this publication, we encourage you to share your feedback with us. Please take a moment to fill out the Feedback Form attached to this publication in order that we can further enhance it for the benefit of all concerned. With our joint efforts, we believe our construction industry will develop further and will continue to prosper for years to come.

ABBREVIATIONS

BD	Buildings Department
C&ED	Customs and Excise Department
CIExpo	Construction Industry Exposition
CoP	Code of Practice
CP	Contingency Plan
EHC	Eastern Harbour Crossing
FSD	Fire Services Department
GBA	Greater Bay Area
GFA	Gross Floor Area
HKCEC	Hong Kong Convention and Exhibition Centre
HKPF	Hong Kong Police Force
HZMB	Hong Kong-Zhuhai-Macao Bridge
HyD	Highways Department
JIT	Just-in-time
LBCP	Land Boundary Control Point
MGCW	Maximum Gross Combined Weight
MiC	Modular Integrated Construction
OVM	Oversized Vehicle Movement
PGVW	Permitted Gross Vehicle Weight
PRD	Pearl River Delta
PCWA	Public Cargo Working Area
RMO	Road Management Office
SPA	Swept Path Analysis
TD	Transport Department
TEU	20-foot Equivalent Unit
TIA	Traffic Impact Assessment
TMLG	Temporary Management Liaison Group
TTM	Temporary Traffic Management
WHC	Western Harbour Crossing
WLP	Wide Load Permit

1. INTRODUCTION

MiC projects are different from convention building projects in that a number of issues need to be resolved at an early stage of the project to decide if MiC can be adopted or not, among which logistics issues are one of them. Logistics[1], in a broader sense, refers to the planning and execution of the efficient transportation and storage of goods from the point of origin to the point of consumption. Transportation is part of logistics, which involves use of a suitable mode of transport to move the goods.

In Hong Kong, the width of a road lane is typically 3.3 m, but may be less than 3 m at some local road sections (see Appendix A). Vehicles delivering a load not wider than 3.0 m could generally be accommodated within a single traffic lane. However, given the size of the modules delivered, speed of travel of the delivery vehicles and presence of road furniture and other road constraints, the delivery could produce some impacts on the traffic flow along the route and at key junctions and intersections. An application for a Wide Load Permit (WLP) from the Transport Department's Licensing Office must be made for vehicles carrying a load wider than 2.5 m, and a Traffic Impact Assessment (TIA) is needed to support the application, in particular for the case of transport of a load width exceeding 3 m.

In this report, the logistics and transport considerations for an MiC project, such as establishment of delivery routes for transporting the modules from a loading point to the project site, taking into account locations of the MiC factory and project site, application for delivery of wide loads and conditions imposed on delivery of wide loads, mode of transport, etc., are given. The logistics arrangement and delivery routes of some completed MiC projects are presented as case examples for reference.

[1] https://en.wikipedia.org/wiki/Logistics and https://www.encyclopedia.com/management/encyclopedias-almanacs-transcripts-and-maps/logistics-and-transportation

2. DELIVERY ROUTE

2.1 Route Planning

In MiC projects, modules are delivered to the project site for assembly and installation. Before a decision is made on the use of MiC, it is necessary to establish that there are feasible routes for transporting the modules from the MiC factory or a loading point to the project site.

A traffic consultant is generally engaged at the project planning/design stage of the project to carry out the feasibility study to establish and plan the delivery routes, taking into account the width of modules, road conditions and constraints for road transport.

The factors that are considered in the route planning are factory location, choice of land boundary control point (LBCP) if land transport is used, choice of container terminal/mid-stream site/River Trade Terminal/Public Cargo Working Area (PCWA) if sea transport is used and arrangement at the project site for receiving the delivery vehicles.

2.2 Factory Location

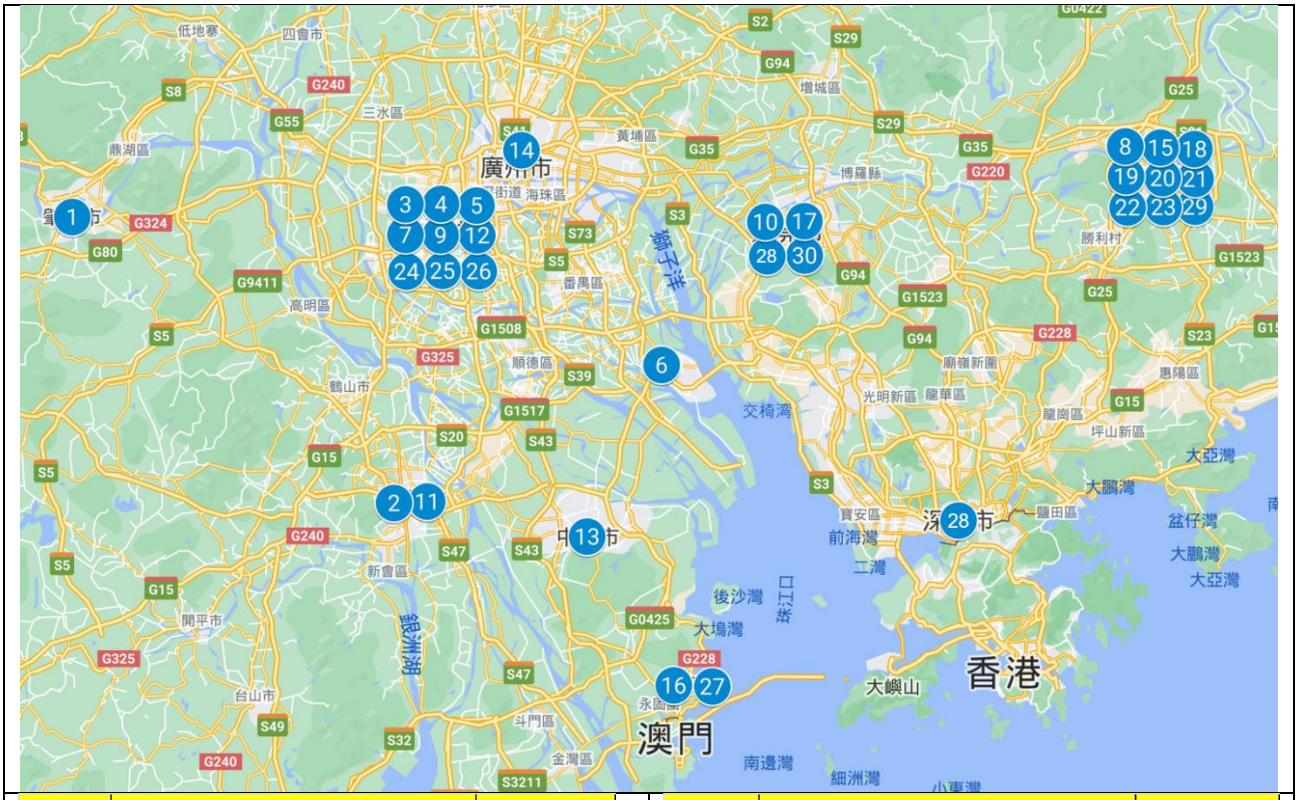
The modules used in the Hong Kong MiC projects so far are produced in the MiC factories in the Greater Bay Area (GBA) (a rebranding of the Pearl River Delta (PRD)[2]). The GBA covers Dongguan (東莞), Foshan (佛山), Guangzhou (廣州), Huizhou (惠州), Jiangmen (江門), Shenzhen (深圳), Zhaoqing (肇慶), Zhongshan (中山) and Zhuhai (珠海), including Hong Kong and Macau, as shown in Figure 1. Some known MiC suppliers located in the GBA, including those on the Buildings Department's Lists of Pre-accepted MiC Systems/Components[3], as well as those for the completed MiC projects in Hong Kong, are shown in Figure 2. As of 7.10.2021, there are 26 MiC suppliers in the GBA. A summary list of the suppliers is given in Appendix B.

In deciding on the mode of transport and logistics arrangement to be used, factory location is an important factor. For factories located inland, such as in Foshan, Guangzhou, Huizhou and Zhaoqing, use of land transport is common. For factories located near the river/coastline, such as Dongguan, Jiangmen, Zhongshan, Zhuhai and Shenzhen, either land transport or sea transport can be used.

[2] https://www.1421.consulting/2018/05/greater-bay-area/

[3] https://www.bd.gov.hk/en/resources/codes-and-references/modular-integrated-construction/mic_steelList.html and https://www.bd.gov.hk/en/resources/codes-and-references/modular-integrated-construction/mic_concreteList.html

Figure 1 - Greater Bay Area



No. on Map	MiC Supplier	Location
1	Aluhouse Co. Ltd.	Zhaoqing
2	Guangdong CIMC Building Construction Co. Ltd.	Jiangmen
3	Nova Deko Modular Building Co. Ltd.	Foshan
4	Nova Techoy Modular Construction Company Limited	Foshan
5	China State Hailong Construction Technology Co. Ltd.	Foshan
6	Aggressive Construction Company Limited	Nanshan, Shenzhen
7	Paul Y. - iMax Ltd.	Foshan
8	Yau Lee Wah Concrete Precast Products Co. Ltd.	Huizhou
9	Shunde Lunjiao Quon Hing Construction Material Co. Ltd.	Foshan
10	Orientfunds Precast Ltd.	Dongguan
11	CIMC	Jiangmen
12	CR Construction Company Limited	Foshan
13	Chevalier (Construction) Co., Ltd.	Zhongshan
14	Unistress Building Construction Limited	Baiyun, Guangzhou
15	Wing Hong Shun Enterprises Limited	Huizhou

No. on Map	MiC Supplier	Location
16	China State Hailong Construction Technology Co. Ltd.	Zhuhai
17	Brilliant (Man Sau) Engineering Ltd.	Dongguan
18	Unistress Building Company Limited	Huizhou
19	i-Box Modular Housing Limited	Huizhou
20	Urban Renewal Authority	Huizhou
21	Techoy Construction Company Limited	Huizhou
22	Aggressive Construction Company Limited	Huizhou
23	Gammon Construction Limited	Huizhou
24	Chinney Construction Co., Ltd.	Foshan
25	Chun Wo Construction & Engineering Co., Ltd.	Foshan
26	Markbox Limited	Foshan
27	Shui On Conctruction Company Limited	Zhuhai
28	Dragages Hong Kong Limited	Shenzhen & Dongguan
29	Unistress Building Construction Limited	Huizhou
30	Paul Y. Modular Integrated Construction Limited	Dongguan

Figure 2 - Some Known MiC Suppliers in the Greater Bay Area (as of 8.12.2021)

2.3 Land Boundary Control Points

When land transport is used, vehicles carrying modules will enter Hong Kong through the LBCPs.

There are six LBCPs for cross-boundary goods vehicles[4], as shown in Figure 3. They are, from east to west, the Sha Tau Kok, Heung Yuen Wai, Man Kam To, Lok Ma Chau, Shenzhen Bay and Hong Kong-Zhuhai-Macao Bridge (HZMB) (Hong Kong Port) LBPCs. The corresponding ports in the Mainland are also shown in the figure.

The choice of the LBCP will depend on its closeness to the factory and/or the project site, hours of operation, etc.

The highway networks in the GBA are shown in Figure 4.

The Heung Yuen Wai, Man Kam To and Lok Ma Chau LBCPs are close to Shenzhen, and they are connected to Huizhou and Shantou via Shenzhen-Huizhou Expressway and Shenzhen-Shantou Expressway respectively. They are suitable for vehicles from cities on the eastern side of the Pearl River.

The Sha Tau Kok LBCP is suitable for vehicles from Yantian Harbour in the case that the modules are transported from abroad by sea to Yantian Harbour first.

The Shenzhen Bay LBCP is connected to Zhongshan via the Coastal Expressway. This LBCP is suitable for vehicles from cities on the western side of the Pearl River, and in western Dongguan and Shenzhen. The port is also suitable for sites located in Yuen Long and Tuen Mun districts.

The HZMB LBCP is suitable for vehicles from cities on the western side of the Pearl River. Through its link in Zhuhai, the HZMB connects with three major expressways, namely the Jing-Zhu Expressway, Guang-Zhu West Expressway and Jiang-Zhu Expressway, and then to the Mainland's fast expanding road network. Major cities on the West Bank of the Pearl River like Guangzhou, Zhongshan, Jiangmen, etc., can be reached easily.

The total number of vehicle trips recorded at the Sha Tau Kok, Heung Yuen Wai, Man Kam To, Lok Ma Chau, Shenzhen Bay and HZMB (Hong Kong Port) LBCPs are 300,000, 60,000, 1,100,000, 3,500,000, 1,800,000 and 300,000 respectively[5] up to the end of 2020.

The operation details of the LBCP are given in Table 1. The Lok Ma Chau and HZMP (Hong Kong Port) LBCPs are operated on a 24-hr basis. The Sha Tau Kok, Heung Yuen Wai and Man Kam To LBCPs are opened from 7 am to 10 pm, whereas the Shenzhen Bay LBCP is opened from 6:30 am to 12 mid-night. There is generally no restriction in the size of modules processed at the LBCPs. The Customs and Excise Department (C&ED) adopts a risk management approach to identify and select cargoes/vehicles/drivers/passengers for inspection at the LBCPs. As and when necessary, the

[4] https://www.customs.gov.hk/en/contact_us/passenger_clearance/ index.html

[5] https://www.td.gov.hk/en/publications_and_press_releases/publications/free_publications/fact_sheet_on_transport/index.html

cargoes/vehicles/drivers/passengers will be selected for inspection at the LBCPs. The inspection methods/equipment used include physical checks, vehicle searches, use of detector dogs, Mobile X-ray Vehicle Scanning Systems and Vehicle X-ray Inspection Systems, etc.

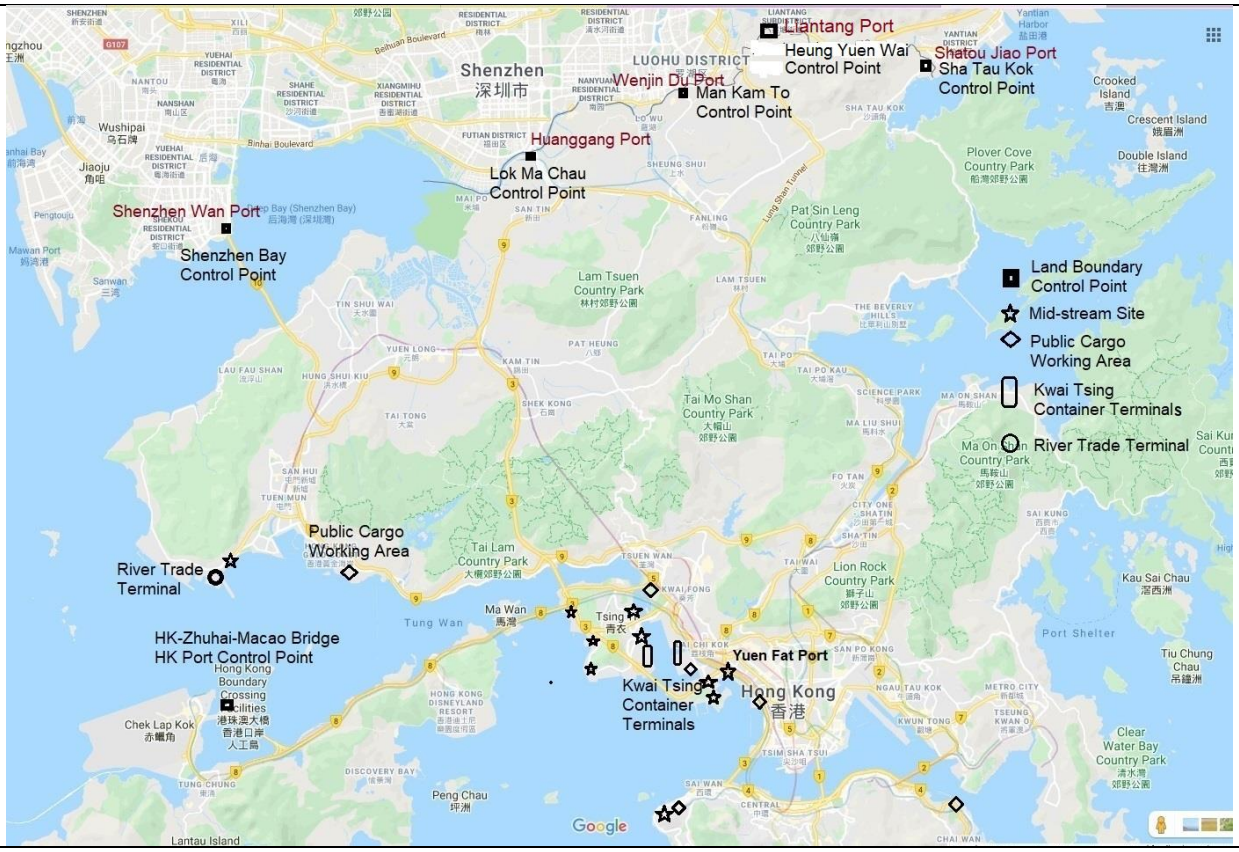


Figure 3 - Locations of Land Boundary Control Points, Kwai Tsing Container Terminals, River Trade Terminal, Mid-stream Sites and Public Cargo Working Areas[6]

Table 1 - Operational Details of LBCPs			
	***Port/* LBCP**	**Hours of Operation**	**Total Number of Vehicle Trips (as of end-2020)**
1.	*Shatou Jiao/* Sha Tau Kok	7 am to 10 pm	300,000
2.	*Liantang Port/* Heung Yuen Wai (became operational on 26.8.2020)	7 am to 10 pm	60,000
3.	*Wenjin Du/* Man Kam To	7 am to 10 pm	1,100,000
4.	*Huanggang/* Lok Ma Chau	24 hours	3,500,000
5.	*Shenzhen Wan Port/* Shenzhen Bay	6:30 am to 12 mid-night	1,800,000
6.	Hong Kong-Zhuhai-Macao Bridge (Hong Kong Port)	24 hours	300,000

[6] The Hong Kong Maritime and Port Board (https://www.hkmpb.gov.hk/en/port.html).

Figure 4 - Highway Connectivity Between Major Cities at Pearl River West[7]

2.4 Container Terminals/ Mid-stream Sites/ River Trade Terminal/ Public Cargo Working Areas

Either sea transport or river transport can be used if the modules are delivered to Hong Kong by sea.

Major port facilities in Hong Kong include container terminals, mid-stream sites, River Trade Terminal and PCWAs, as shown in Figure 3. The container terminals handled over 20 million TEU[8] (20-foot equivalent unit) per year, representing 78% of the port container throughput. The remaining 22% was handled by mid-stream sites, River Trade Terminal, PCWAs, buoys and anchorages, and other wharves. Details of these facilities are given below:

(a) Container terminals[9]. The container terminals are located at the Kwai Chung-Tsing Yi Basin. There are nine container terminals and they are operated by five operators, occupying 279 hectares of land, providing 24 berths and 7,694 m of deep water frontage. The five operators are: Asia Container Terminals Limited, COSCO-HIT Terminals (Hong Kong) Limited, Goodman DP World, Hongkong International Terminals Limited and Modern Terminals Limited. The water depth of the Kwai Tsing Container Basin is 15 m.

[7] https://www.hzmb.hk/eng/about_overview_06.html

[8] TEU stands for 20-foot equivalent unit, which is an unit of cargo capacity used to describe the capacity of container ships and container terminals. It is based on the volume of a 20-foot-long (6.1 m), 8 ft (2.44 m) wide intermodal container.

[9] Hong Kong Container Terminal Operators Association Limited (HKCTOA) (http://www.hkctoa.com/introduction).

(b) Mid-stream sites[10]. Mid-stream operation is the loading and unloading of containers while the container ship is at sea, with barges or dumb steel lighters performing the transfer, distribution or landing of containers to piers nearby. There are now 10 mid-stream sites in Hong Kong, occupying a total land area of 33 hectares and a water frontage of about 3,310 m. They are either under long term or short term tenancies. There are around 250 container barges involved in providing the mid-stream services.

(c) River Trade Terminal[11]. There is only one River Trade Terminal in Hong Kong. It is located near Pillar Point, just to the west of Tuen Mun. The terminal is managed by River Trade Terminal Co. Ltd. (RTT) which is a 50/50 joint venture between Hutchison Port Holdings Limited and Sun Hung Kai Properties Limited. The terminal is the largest river trade container terminal in the PRD, providing 65 hectares of terminal area and 45 hectares of stacking area with 49 berths along a total quay length of 3,000 m. The terminal has 25 quay cranes, 12 rubber-tyred gantry cranes, 11 reach stackers and 15 front loaders. Its main function is to consolidate bulk cargo shipped between Hong Kong and the ports in the PRD.

(d) Public Cargo Working Areas[12]. The PCWAs are managed by the Marine Department. The operation of the PCWAs involves short-term allocation of berths and waterfront working areas for loading and unloading of cargo, including bulk cargo and containerised cargo, to and from barges. There are six PCWAs and they are located in Chai Wan, Western District, Rambler Channel, New Yaumatei, Stonecutters Island and Tuen Mun, providing a combined total quay length of 4,852 m.

For modules carried by international container sea freight, both terminal and mid-stream operations are feasible. Mid-stream operation is more affected by weather and is lower in cost as compared with terminal operation. Modules are also more susceptible to damage since more lifting/handling is involved. Nevertheless, mid-stream operation is commonly used for transferring modules from the container ship originating from ports in the GBA to mid-stream sites by barge.

A comparison of the terminal and mid-stream operations, in terms of charges, speed of operation, effect of weather change, time limit of operation, etc., is given in Table 2.

If the factory is located near Hong Kong (e.g. on the western side of the PRD), modules can be transported using barges, mid-stream sites, River Trade Terminal and PCWAs. The River Trade Terminal is more suitable for use by project sites located at Tuen Mun, Yuen Long and Tin Shui Wai. For project sites located on Hong Kong Island, use of the Chai Wan and Western District PCWAs is recommended because use of cross-harbour tunnel can be avoided. However, there are limited operation space, storage area and operation devices for lifting of modules in the PWCAs.

[10] The Hong Kong Mid-stream Operators Association Ltd. (HKMOA) (http://www.hkmoa.com/Facilities.aspx?lang=E).
[11] River Trade Terminal Co. Ltd. (RTTC) (http://www.rttc.com.hk/rtt/eng/about_us_com.html).
[12] https://www.mardep.gov.hk/en/pub_services/ocean/pcwa.html

Table 2 - Comparison of Terminal Operation and Mid-stream Operation (after HKU, 2019)		
Item	Terminal operation	Mid-stream operation
Charges	High	Low
Speed of Operation	Fast	Slow
Working Method	Gantry crane	Derrick on barge
Effect of Weather Change (e.g. rain, wind and wave)	Low	High
Time Limit of Operation	24-hour	24-hour (additional charge during night time)
Pick-up Time	24-hour	0800 hr-1900 hr
Damage to Cargo	Low	High
Demurrage & Detention Charges[13]	Strict	Flexible

2.5 Arrangement at Project Site

At the entry/exit of the project site, adequate sight line should be maintained for the motorists and pedestrians at all times. Provision of two gantries to allow one way traffic flow within the site is recommended. Examples of use of two gantries in MiC projects are InnoCell at Tai Po and FSD Quarters at Pak Shing Kok (see Sections 6.2.3 and 6.2.4). If this is not feasible due to site constraints, a wider gantry, say 7.5 m, or a width determined by a detailed swept path analysis, should be allowed for.

To facilitate just-in-time (JIT) delivery in the MiC operation, temporary loading bay, contingency parking place, etc., close to the site should be identified. For some larger sites, an internal site area assigned for holding a limited stock of modules in case the JIT delivery breaks down should be considered.

Affected residents, road users, shops and other concerned parties should be informed prior to carrying out the delivery.

[13] Demurrage refers to the charge that the merchant pays for the use of the container within the terminal beyond the free time period. Detention refers to the charge that the merchant pays for the use of the container outside of the terminal or depot, beyond the free time period.

3. APPLICATION FOR DELIVERY OF WIDE LOADS

After the delivery routes have been established, a TIA in respect of the routes should be carried out for the case of transport of a load width exceeding 2.5 m, in which case a Wide Load Permit (WLP) from the Licensing Office/Transport Department (TD) for the delivery vehicles is needed, in accordance with Regulation 54 of the Road Traffic (Registration and Licensing of Vehicles) Regulations (Cap. 374E). Details of the WLP application can be found in the Guidelines on Application for Wide Load Permit[14] published by TD (2019A) and the Reference Material on the Statutory Requirements for MiC Projects[15] issued by the CIC (2020).

[14] https://www.td.gov.hk/en/publications_and_press_releases/publications/free_publications/index_categoryid_8.html and https://www.td.gov.hk/filemanager/en/publication/guidelines%20on%20application%20for%20wide%20load%20permit.pdf

[15] https://mic.cic.hk/files/Information/1/File/Reference_Material_2020.pdf

4. CONDITIONS IMPOSED ON DELIVERY OF WIDE LOADS

4.1 General

According to Regulation 55 of the Road Traffic (Traffic Control) Regulations (Cap. 374G), no driver shall drive on a road a vehicle that is so loaded that the load (a) in the case of a vehicle other than a trailer, extends more than 1.5 m from the foremost part of the vehicle; (b) extends backwards more than 1.4 m behind the rearmost part of the vehicle; or (c) extends sideways so that the total width of the load is in excess of 2.5 m, as shown in Figure 5. A WLP is needed for a vehicle delivering a load wider than 2.5 m. In granting a WLP for delivery of wide loads, conditions will be imposed by the Licensing Office/TD. The important conditions stated in the WLP that logistics practitioners should follow are given in the sections below.

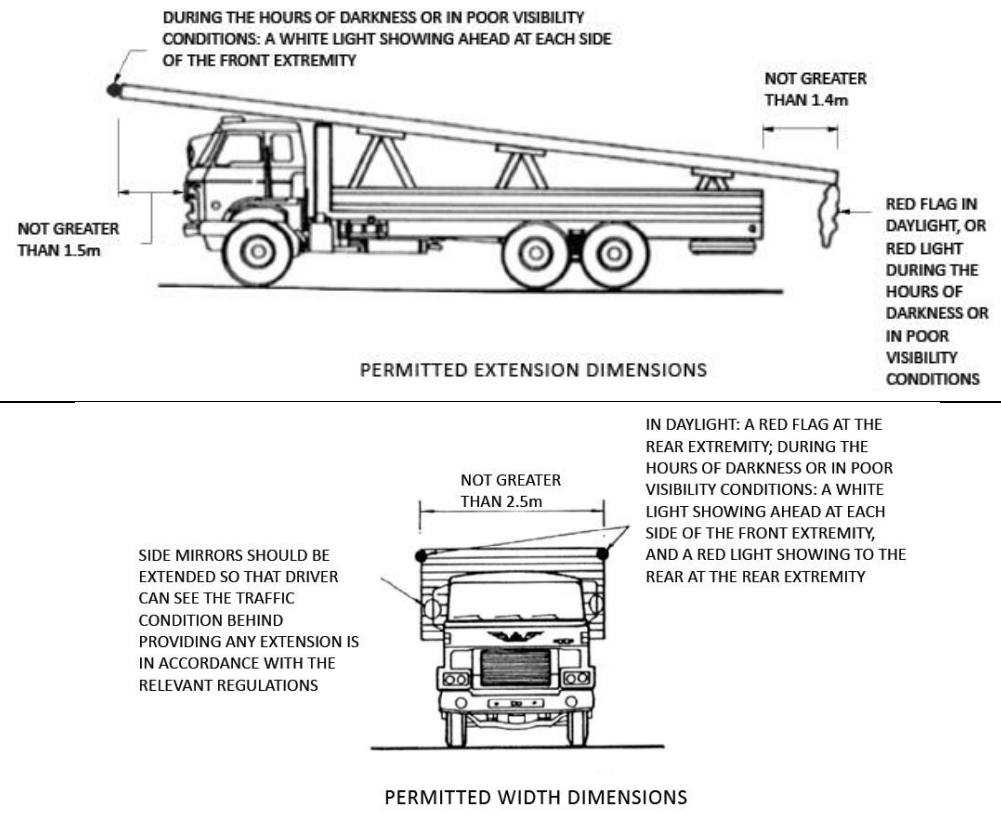


Figure 5 - Permitted Wide and Long Loads
(as extracted from Diagram 5.9.1 of the CoP for Loading of Vehicles (TD, 2019B)

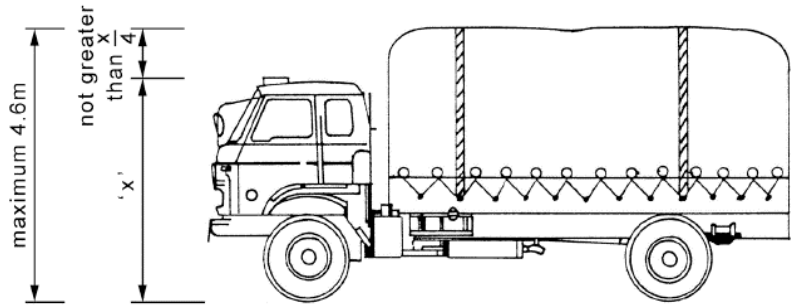
4.2 Length of Delivery Vehicles

According to Section 5.9.5 of the Code of Practice (CoP) for the Loading of Vehicles[16] (TD, 2019B), a WLP will not be issued to a vehicle less than 9.1 m in length.

[16] https://www.td.gov.hk/filemanager/en/publication/cop_loading_of_vehicles_eng.pdf

4.3 Height of Load

According to Section 5.9.5 of the CoP for the Loading of Vehicles, even for vehicles with a wide or long load permit, the total height of the load with a medium/heavy goods vehicle must not exceed 4.6 m above the road surface, as shown in Figure 6. The height of the load should not be disproportionate to the vehicle, causing instability to the vehicle. Such loaded vehicle is particularly vulnerable to overturning at bends, in high wind situations such as typhoon conditions, or in exposed locations such as the Tsing Ma Bridge where even under relatively normal conditions, high cross winds can be experienced (Section 2.3.11 of the CoP for the Loading of Vehicles (TD, 2019B)).



Note: Height of load should not normally extend above the roof of the cab by more than ¼ of the height of the cab from the ground, except in the case of specially designed and enclosed vehicles. Also, the load must not extend beyond the specified overall height of the vehicle (i.e. 4.6 m for medium/heavy goods vehicle or 3.5 m for light goods vehicle).

Figure 6 - Restricting Height of Loads
(as extracted from Diagram 2.3.3 of the CoP for Loading of Vehicles (TD, 2019B))

4.4 Use of Road Bridges

In Hong Kong, the headroom of new and existing overbridges, vehicle underpasses and footbridges is 5.1 m or 5.0 m (HyD, 2013). Beneath some bridges, gantries and other structures, the clearance provided may be less than the standard minimum requirement of 5 m, or even less than the maximum permitted vehicle height of 4.6 m (see Section 2.3.11 of the Code of Practice for the Loading of Vehicles (TD, 2019B)). In such situations, regulatory and/or warning traffic signs are erected to inform drivers of the restriction/prohibition. Drivers transporting high loads should pay particular attention to such traffic signs, as shown in Figure 7. On-site investigation is required in planning the logistics route to evaluate the influence of road bridges.

'Height limit' regulatory sign – no vehicles over height shown

'Height restricted ahead' warning sign – restricted headroom on road ahead

'Height restriction' warning sign – mounted on structure with restricted headroom over a road

Figure 7 - Height Limit/Restriction Traffic Signs
(as extracted from Section 2.3.11 of the CoP for Loading of Vehicles (TD, 2019B)

4.5 Use of Road Tunnels

There are 22 road tunnels, including 3 immersed-tube cross-harbour tunnels, in Hong Kong, as shown in Figure 8. The latest road tunnel constructed was Tuen Mun-Chek Lap Kok Tunnel connecting Tuen Mun Area 40 with HZMB (Hong Kong Port), which was opened in December 2020. Contact details of the tunnel and control area operators who should be consulted are given in the TD's website[17].

According to Condition No. 9 given in Form TD 290 (for WLP application) (TD, 2019C), the WLP holder is required to seek approval from the relevant authority prior to carrying the load in any area or private road of which the management authority or owner may restrict the access of the vehicle.

For the tunnels under the jurisdiction of the Road Tunnels (Government) Ordinance (Cap. 368), a permit should be obtained for the passage of the vehicle if the width of the vehicle exceeds 2.5 m (see Regulation 14 of the Road Tunnels (Government) Regulations (Cap. 368A)). Application for the permit shall be made to the respective tunnel operators at least 48 hours before the intended passage, and shall contain the following particulars:

(a) details of the vehicle and its load; and
(b) the time, date and direction of the proposed passage.

For other tunnels as shown in Figure 8, the applicant is required to approach directly and apply to the respective tunnel and control area operators for approval of transporting the modules across the tunnel.

For reference, the details required for seeking approval for use of the Eastern Harbour Crossing/Western Harbour Crossing in transporting modules wider than 2.5 m in particular are given in the Reference Material on the Statutory Requirements for MiC Projects (CIC, 2020).

17 https://www.td.gov.hk/filemanager/en/content_5010/contact_tunnels_control_areas_operators_revised_20201227.pdf

Notes:	1. The tunnels with their names shown in yellow background are under the jurisdiction of the Road Tunnels (Government) Ordinance (Cap. 368). 2. The Lantau Link, Cheung Tsing Tunnel and Ting Kau Bridge are within the Tsing Ma Control Area, which form part of Route 3. 3. The Eagle's Nest Tunnel, the Sha Tin Heights Tunnel and the Tai Wai Tunnel, the Nam Wan Tunnel and the Stonecutters Bridge are within the Tsing Sha Control Area, which form part of Route 8.

Figure 8 – Location Plan of the Road Tunnels in Hong Kong[18]

4.6 Self-arranged Escort Vehicles

A condition of issuing a wide or long load permit is that the vehicle carrying the load must be escorted by a vehicle at the front and a vehicle at the rear each displaying a sign "Wide Load" (see Section 5.9.6 of the CoP for the Loading of Vehicles (TD, 2019B)).

The self-arranged escort vehicle arrangement for transporting wide loads is shown in Figure 9. The escort vehicle should be equipped with an amber flashing light in accordance with Regulation 111 of the Road Traffic (Construction and Maintenance of Vehicle) Regulations (Cap. 374A), and shall display in a prominent position a sign conforming with the details as those given in the figure, either at the front, rear or on the roof of the vehicle (but such that the flashing light is not obscured). On the leading escort vehicle, the sign shall be displayed to the front so as to face oncoming vehicles, and on the trailing escort vehicle, the sign shall be displayed to the rear to face following vehicles.

[18] https://www.td.gov.hk/en/transport_in_hong_kong/tunnels_and_bridges_n/index.html

When mounted on the roof of an escort vehicle, signs may be double-sided. Approval for the installation of amber flashing lights on a vehicle must however be obtained from TD.

As mentioned in Section 5.9.7 of the CoP for the Loading of Vehicles (TD, 2019B), the Road Management Office (RMO)/Police must always be consulted as to the exact duties of the escort vehicles, and RMO/Police at times may require that they provide or assist in the escorting of wide or long loads. This is particularly relevant in respect of abnormally wide loads, as it may be necessary to direct other traffic and only the police have the authority to do this. Contacts of the RMO/Police are given in Appendix C.

It is recommended that adequate securing, safety and delivery support measures are provided for delivery of MiC modules, if necessary.

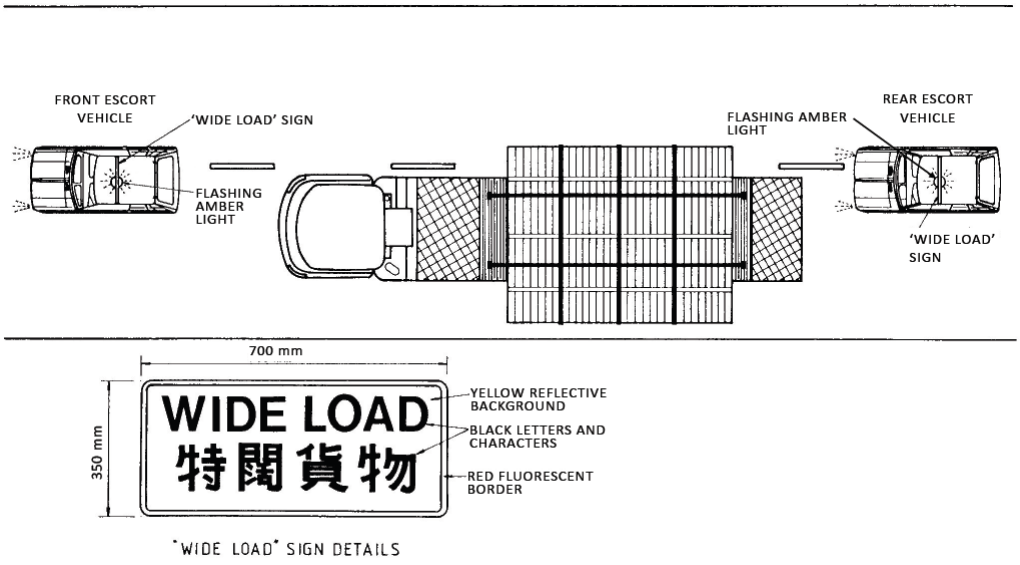


Figure 9 - Transport of Wide Loads
(as extracted from Diagram 5.9.3 of the CoP for Loading of Vehicles (TD, 2019B))

4.7 Temporary Traffic Management Schemes

A temporary traffic management (TTM) scheme may be needed for narrow road segments, sharp bends, junctions, vehicular ingress and egress to destinations, etc., specific to the project, which should be highlighted in the TIA. The TTM schemes put in place for the project should be designed in accordance with the CoP for the Lighting, Signing and Guarding of Road Works (HyD, 2017).

When a TTM scheme is involved, early liaison with TD and RMO is needed. TD and RMO will be able to provide comment on the submitted TTM scheme within 2 to 3 weeks depending on the complexity of the proposal. Traffic police will only be needed on a case-by-case basis to assist in the setup of a TTM scheme and supervise its operation.

4.8 Mock-up Trial Run

A mock-up trial run is normally required to ensure that there is adequate carriageway width for smooth maneuvering of the vehicles applied. A trial run using the largest size module for establishing the transport route feasibility is recommended. Liaison with TD and RMO is required,

and the trial run should be conducted at the permitted time to minimize the disruption to traffic flow at the affected public road network.

In case that temporary alteration of existing traffic aids and street furniture is needed, comments from TD and HyD should be sought. The applicant should also consult/inform the affected locals/shopkeepers/concerned parties/cycling associations (where appropriate) prior to carrying out the operation.

5. TRANSPORT OF MIC MODULES

5.1 Land Transport

Vehicles that can be used for delivery of modules are: Medium Goods Vehicle (Class Code 18), Heavy Goods Vehicle (Class Code 19)[19], and Articulated Vehicle (Class Code 20)[20]. An articulated vehicle consists of a tractor and a trailer. Details of these vehicles are given in Table 3.

The common types of trailers used are flatbed and low-bed trailers because of their versatility. The main advantage of these trailers is that modules can be vertically lifted by a crane from the top of the trailer or uploaded horizontally by other equipment.

A flatbed/low-bed trailer is typically up to 12 m long and depending on the number of axles of the trailer, it can carry a load of up to 44 tonnes. The standard height of a flatbed and low-bed trailer is 1.5 m and 0.9 m from the ground respectively. Given a vehicle height limit of 4.6 m, the maximum height of module that a flatbed and low-bed trailer can accommodate is 3.1 m and 3.7 m respectively, as shown in Figure 10.

The operation/loading of flatbed/low-bed trailers should follow that given in the CoP for the Loading of Vehicles (TD, 2019B).

The number of licensed medium goods, heavy goods and articulated vehicles in Hong Kong (as of May 2021) is given in Table 4. There are some 35,000 licensed medium goods vehicles, 6,700 heavy goods vehicles, 7,500 tractors and 12,000 trailers available in the market.

[19] https://www.td.gov.hk/filemanager/en/publication/guide_to_driving_test_mgv_and_hgv_eng_202010.pdf
[20] https://www.td.gov.hk/filemanager/en/publication/guide_to_driving_test_av_eng_202010.pdf

Table 3 - (A) Overall Dimensions of Medium/Heavy Goods Vehicles and Articulated Vehicles				
Vehicles[21]	Overall Length (m)	Overall Width (m)	Overall Height (m)	Maximum Gross Vehicle Weight (tonnes)
Medium Goods Vehicle	11	2.5	4.6	24
Heavy Goods Vehicle				
Rigid	11	2.5	4.6	38
Articulated	16	2.5	4.6	38

(B) Maximum Gross Combined Weights for Articulated Vehicles
(as extracted from Diagram 1.3.1 of the CoP for the Loading of Vehicles (TD, 2019B))

Type of Combination of Articulated Vehicles		Inner Axle Spacing[22] (m)	Maximum Gross Combined Weight[23] (tonnes)
2-axle tractor with 1-axle trailer		<2.1 ≥2.1 ≥3.1	20 22 24
2-axle tractor with 2-axle trailer		<2.9 ≥2,9 ≥3.1 ≥3.6 ≥4.0	24 26 29 32 34
2-axle tractor with 3- or more axle trailer		≥4.2	38
3- or more axle tractor with 1-axle trailer		<2.0 ≥2.0 ≥2.7 ≥3.0 ≥4.0 ≥4.4	22 24 26 28 30 32
3-or more axle tractor with 2- or more axle trailer		<2.0 ≥2.0 ≥2.3 ≥3.2 ≥4.0	24 26 30 34 38
3- or more axle tractor with 3- or more axle trailer		≥4.7 ≥5.2 ≥5.7	40 42 44

[21] Schedule 1 of the Road Traffic (Construction and Maintenance of Vehicle) Regulations (Cap. 374A).

[22] Inner axle spacing means the distance between the rearmost axle of a tractor and the foremost axle of the trailer.

[23] Maximum Gross Combined Weight (MGCW) refers to the combined weight of a tractor and trailer. In addition to not exceeding the maximum gross vehicle weights and maximum axle weights of the tractor and trailer when measured individually, the combined weight of tractor and trailer together must not exceed the MGCW (Section 1.3.7 of the CoP for Loading of Vehicles (TD, 2019B)).

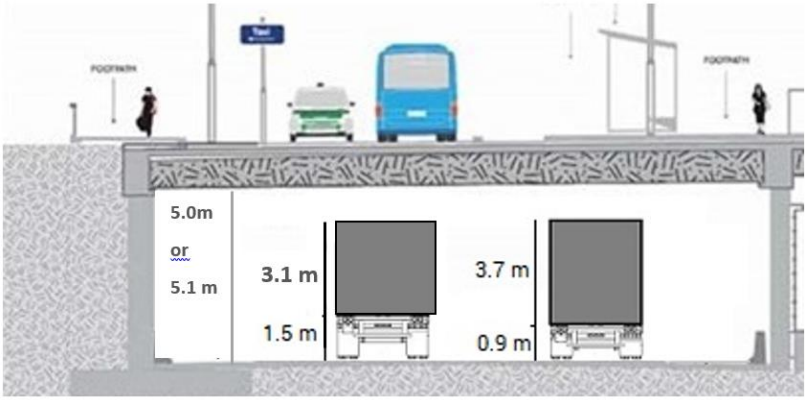


Figure 10 - Headroom of Overbridges

Table 4 - Registered and Licensed Medium/Heavy Goods Vehicles and Articulated Vehicles (as of May 2021)[24] [25] in Hong Kong

Vehicle			No. Registered	No. Licensed
Medium Goods Vehicles			35792	34998
Heavy Goods Vehicles			6913	6735
Articulated Vehicles	Tractor	2 axles	6479	6215
		More than 2 axles and unclassified	1502	1460
	Trailer	-	15284	12316

5.2 Marine Transport

There are different types of barges with different shipping capacities, e.g. 96, 120, 150, 300 and 350 tonnes in terms of load, and 300 to 500 TEU in terms of volume. A summary of the TEU capacities for common container sizes is given in Table 5. A typical 96-tonne barge is capable of taking 15 to 20 modules per delivery (Figure 11).

The maritime transport of MiC modules is similar to that of containers. For example, the T system module of a company can be transported using patented U-type frames. These frames cradle the modules to protect them from transportation damage and allow the module to be stacked aboard shipping vessels. Designed to be reused, the U-type frames can be packed into standard shipping containers from the destination and returned to the factories for reuse.

[24] https://www.td.gov.hk/en/publications_and_press_releases/publications/free_publications/monthly_traffic_and_transport_digest/index.html and https://www.td.gov.hk/filemanager/en/content_5045/table41a.pdf

[25] https://www.td.gov.hk/filemanager/en/content_5045/table41b.pdf

Table 5 - TEU Capacities for Common Container Sizes[26]

Length	Width	Height	Internal Volume	TEU
20 ft (6.1 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	1,172 cu ft (33.2 m^3)	1
40 ft (12.2 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	2,389 cu ft (67.6 m^3)	2
48 ft (14.6 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	3,264 cu ft (92.4 m^3)	2.4
53 ft (16.2 m)	8 ft (2.44 m)	8 ft 6 in (2.59 m)	3,604 cu ft (102.1 m^3)	2.65
High cube				
20 ft (6.1 m)	8 ft (2.44 m)	9 ft 6 in (2.90 m)	1,520 cu ft (43 m^3)	1
Half height				
20 ft (6.1 m)	8 ft (2.44 m)	4 ft 3 in (1.30 m)	680 cu ft (19.3 m^3)	1

Figure 11 - Transport Using Barges

As compared with barges, container ships have larger capability of transporting modules, and their volumes are usually higher than 3,000 TEU, and can be as high as 19,000 TEU (Figure 12).

Figure 12 - Transport Using Container Ships

[26] https://en.wikipedia.org/wiki/Twenty-foot_equivalent_unit

6. CASE EXAMPLES

6.1 General

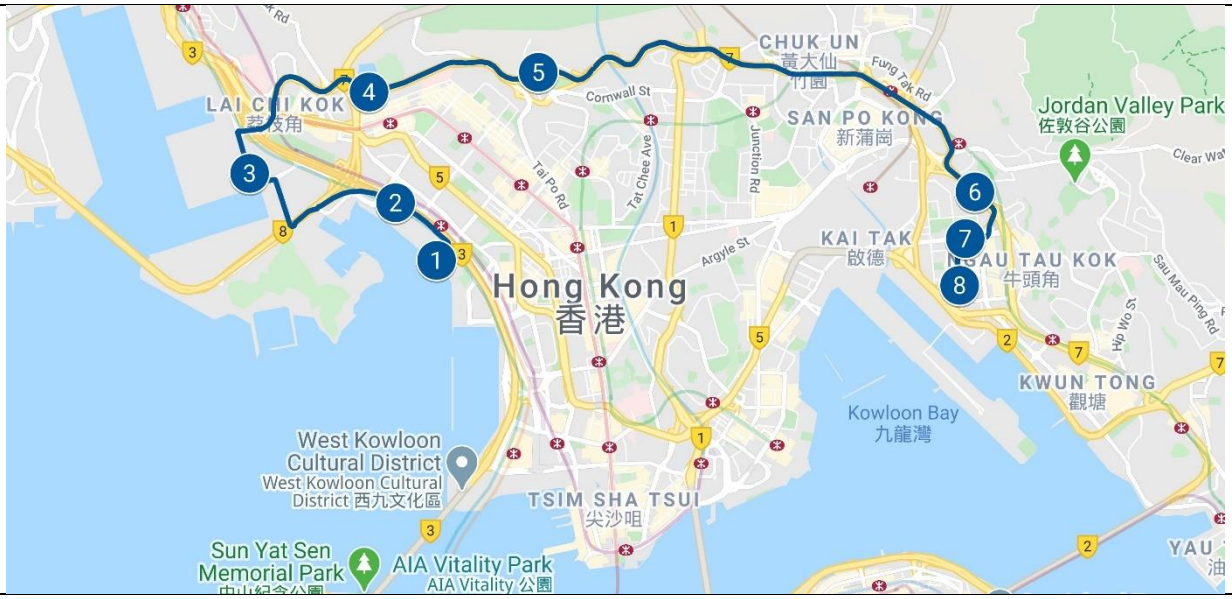
The delivery routes and logistics arrangement of the following eleven projects have been examined:

(1) MiC Display Centre at Kowloon Bay
(2) CIExpo2019 at Wanchai
(3) Innocell at Tai Po
(4) FSD Quarters at Pak Shing Kok
(5) Quarantine Facilities at Lei Yue Mun Park and Holiday Village (Sites A and B)
(6) Quarantine Camp at Penny's Bay (Phase 1A)
(7) Quarantine Camp at Penny's Bay (Phase 1B)
(8) Quarantine Camp at Penny's Bay (Phase 2)
(9) Quarantine Camp at Penny's Bay (Phase 3A)
(10) Quarantine Camp at Penny's Bay (Phase 3B)
(11) North Lantau Hospital Hong Kong Infection Control Centre at Lantau

The details are given in Figures 13 to 23 and in Appendix D.

6.2 Projects

6.2.1 MiC Display Centre at Kowloon Bay



Route:
1) Yuen Fat Port ➔ 2) Lin Cheng Road ➔ 3) Container Port Road South ➔ 4) Ching Cheung Road ➔ 5) Lung Cheung Road ➔ 6) Kwun Tong Road ➔ 7) Kai Cheung Road ➔ 8) MiC Display Centre

Details:
The MiC Display Centre is located within the CIC-Zero Carbon Park complex in Kowloon Bay and is the first building constructed using MiC in Hong Kong. The Centre functions as a visitor centre and exhibits flats built using MiC. The Centre is also used to showcase compliance of each of the modules' specific functions with the relevant Hong Kong building requirements.

The Centre has a 14 m wide x 17 long footprint. It is a 2-storey 9.8 m high building with a gross floor area (GFA) of 334.9m^2. The Centre consists of five types of show flats, including a hotel unit, hostel unit, elderly home unit, a 1-bedroom residential flat and a 3-bedroom residential flat.

The Centre consists of 10 modules. All the modules are rectangular in shape, up to 7.2 m long and 4.5 m wide. The modules on the ground floor have a height of 3.3 m, while those on the first floor are 3.45 m high.

The MiC supplier was CIMC at Jiangmen.

A traffic management liaison group (TMLG) meeting was held on 15.6.2018 prior to the delivery to discuss the logistics arrangement. Representatives from TD, RMO/HKPF, contractor and traffic consultant attended the meeting, and traffic items, including method, route and time of delivery, and Temporary Traffic Management (TTM) schemes were discussed. Due to shortage in storage space at the site, only one module was delivered to the site at one time while the second piece was stored at Sheung Yee Street adjacent to the site vehicular access enclosed by the TTM scheme.

A contingency plan was put in place, including use of standby rescue mobile cranes and trailers, and special traffic arrangement to deal with breakdown scenarios.

The modules were delivered by a 96-tonne barge from Jiangmen to Yuen Fat Port (a mid-stream site) at Cheung Sha Wan on 31.7.2018, which were then delivered by a 16.5 m long articulated vehicle with low-bed trailers to the building site.

The modules were delivered on 2.8.2018 between 0100 hr and 0500 hr. The total length of the route was about 16 km. The travelling speed of the vehicle was about 30 to 40 km/h throughout the entire delivery, giving a total delivery time of about 120 minutes.

One mobile crane with a maximum lifting capacity of 100 tonnes was used to lift the modules.

Figure 13 - Delivery Route of Modules for MiC Display Centre at Kowloon Bay

6.2.2 CIExpo 2019 at Wanchai

Land Route:
WHC (In - Red Route): 1) Man Kam To ➔ 2) Ho Sheung Heung Road ➔ 3) Castle Peak Road (Chau Tau) ➔ 4) San Tin Highway ➔ 5) Yuen Long Highway ➔ 6) Tuen Mun Road ➔ 7) Tsuen Wan Road ➔ 8) Tsing Kwai Highway ➔ 9) Western Harbour Crossing➔ 10) Central Wan Chai Bypass ➔ 11) HKCEC
WHC (Out - Purple Route): 1) HKCEC ➔ 2) Western Harbour Crossing ➔ 3) Tsuen Wan Road ➔ 4) Tuen Mun Road ➔ 5) Shenzhen Bay
EHC (In and out - Blue Route): 1) Ho Sheung Heung Road ➔ 2) Kwu Tung ➔ 3) Fanling Highway ➔ 4) Tolo Highway ➔ 5) Tai Po Road ➔ 6) Lung Cheung Road ➔ 7) Kwun Tong Bypass ➔ 8) Eastern Harbour Crossing ➔ 9) HKCEC

Details:
The CIExpo 2019 was held from 17 to 20.12.2019 at the Hong Kong Convention and Exhibition Centre (HKCEC) in Wanchai.

For the event, 10 MiC modules were delivered to HKCEC for display. Five modules were provided by Paul Y at Kwu Tung, Sheung Shui. One module each was provided by Hailong and CIMC at Shenzhen and Dongguan respectively, and three by Aluhouse at Foshan. The modules are up to 8.7 m long and 3.4 m wide.

Ten articulated trucks with 10 to 11 m long, 6-axle low-bed trailers with a maximum gross combined weight of 40 tonnes were used. The maximum vehicle height was 4.34 m, which was within the height limit of the HKCEC Phase 2 Truck Marshalling Area of 4.55 m. Self-arranged front and rear escort vehicles were provided for each delivery vehicle as required by the WLP.

The modules from CIMC (1 no.) and Aluhouse (3 no.) were delivered from Dongguan and Foshan respectively to HKCEC via the Western Harbour Crossing (WHC) (Red Route). The trucks entered Hong Kong via the Man Kam To LBCP (Red Route) and left Hong Kong via the Shenzhen Bay LBCP (Purple Route). There was no customs inspection for the trucks going

through the Man Kam To and Shenzhen Bay LBCPs at that time. The modules from Paul Y. and Hailong were delivered to HKCEC via the Eastern Harbour Crossing (EHC) (Blue Route).

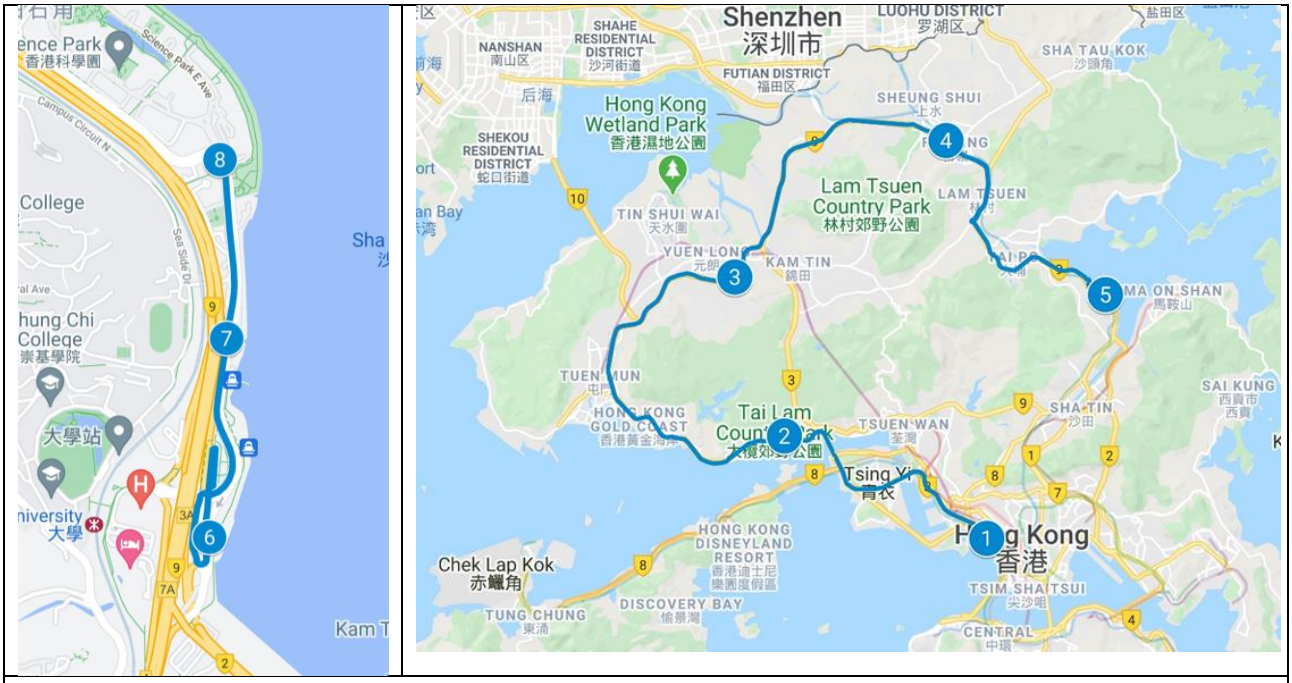
Application to WHC and EHC was made in advance prior to the use of the tunnels. Application letter, vehicle/ trailer registration details, WLP of the vehicle and 3rd party insurance of the vehicle/ trailer were submitted (see Section 4.5).

The modules reached Hong Kong on 16.12.2019 at 2:00 am to 3:00 am, arriving at HKCEC at around 4:00 am to 5:00 am. On the return trip, the modules left HKCEC on 21.12.2019 at 12:00 am.

Two mobile cranes with a maximum lifting capacity of 45 tonnes were used to lift the modules.

Figure 14 - Delivery Route of Modules for CIExpo 2019 at Wanchai

6.2.3 Innocell at Tai Po



Sea then Land Route:
1) Yuen Fat Port ➔ 2) Tuen Mun Road ➔ 3) Yuen Long Highway ➔ 4) Fanling Highway ➔ 5) Tolo Highway ➔ 6) Sui Cheung Street ➔ 7) Science Park Road➔ 8) InnoCell Site, Tai Po

Details:
InnoCell is a pilot project of using MiC in Hong Kong. It is located in the Hong Kong Science Park at Tai Po. The development consists of a 17-storey high building on a 2,990 m^2 site adjacent to the southeast entrance of the Hong Kong Science Park. It provides a minimum of 500 bedspaces with supporting ancillary facilities, including recreational and shared living/working space integrated with the residential units.

For the development, a total of 418 steel modules providing 5 types of rooms were used. The maximum width of the module is 3.1 m.

The MiC supplier was CIMC at Jiangmen.

The modules were delivered by barge from Jiangmen to Yuen Fat Port at Cheung Sha Wan. Each barge took on average 23 modules. From Yuen Fat Port, the modules were delivered by land transport to the building site.

Five medium goods vehicles were used. Self-arranged front and rear escort vehicles were provided for each delivery vehicle as required by the WLP. Trial run was carried out prior to the delivery.

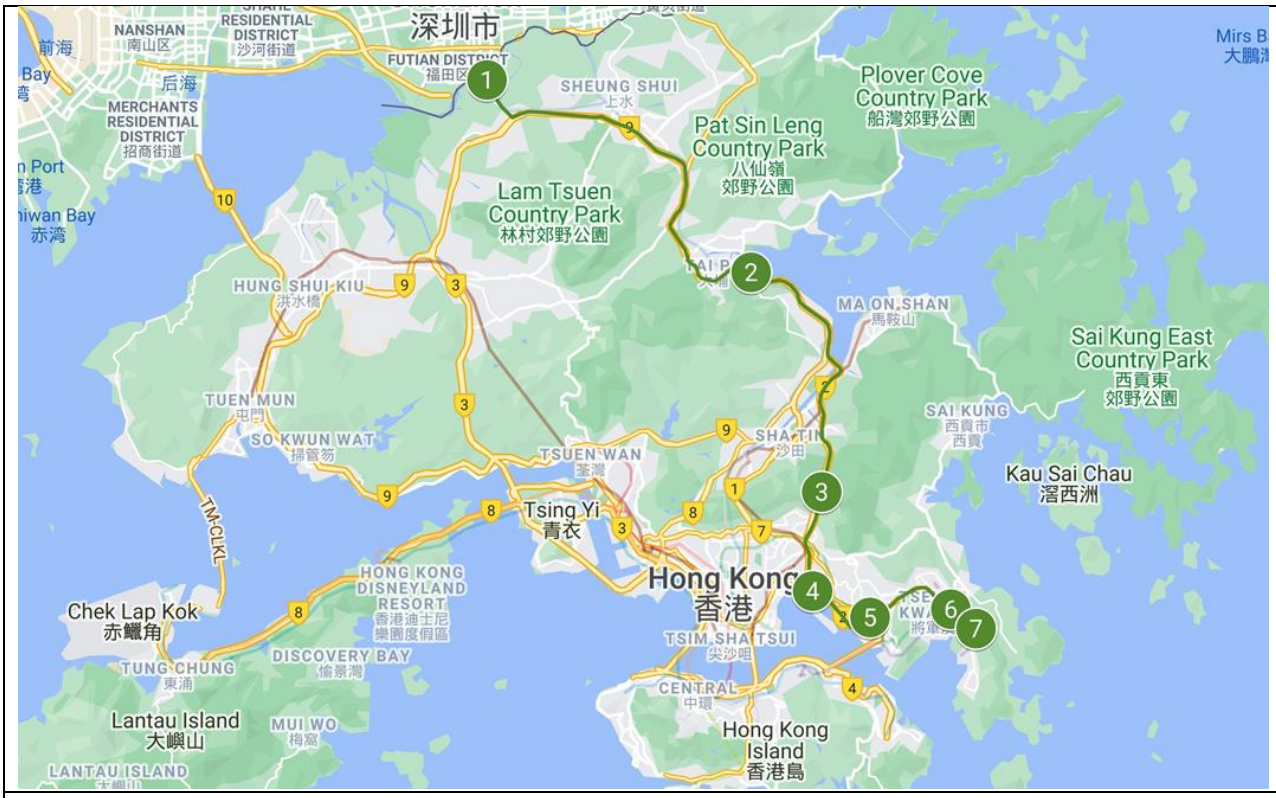
To achieve just-in-time (JIT) delivery, a temporary lay-by area at Sui Cheung Street, which is 2.1 km from the site and allowed parking of 5 vehicles, was provided for the project.

The land delivery from Yuen Fat Port commenced on 1.1.2020 and was completed in May 2020. The delivery was made between 1000 hr and 1600 hr.

Two tower cranes with a maximum lifting capacity of 27 tonnes at 25 m jib length were used to lift the modules. On average, it took 25 to 35 minutes to lift and install one module, and 10 to 12 modules were installed per day. At the building site, two gantries were provided, and both gantries were 7.5 m wide.

Figure 15 - Delivery Route of Modules for InnoCell at Tai Po

6.2.4 FSD Quarters at Pak Shing Kok



Land Route:

1) Huanggang Port ➔ 2) Fanling Highway/ Tolo Highway ➔ 3) Tate's Cairn Tunnel ➔ 4) Kwun Tong Bypass ➔ 5) Tseung Kwan O Road ➔ 6) Wan Po Road ➔ 7) Pak Shing Kok Road / FSD Quarters at Pak Shing Kok

Details:

The project comprises five quarters blocks: four blocks are 16-storey high and one is 17-storey high. There are 8 units on each floor. The quarters provide a total of 648 nos. 3-bedroom units of 50 m^2 in size. The development also comprises ancillary facilities, including a Building Management Office, a Multi-Function Room, outdoor children playground and covered walkway, etc.

A total of 3,726 MiC modules of 9 different types were used. The maximum weight of the module is 24 tonnes and the maximum width is 2.5 m.

The MiC supplier was Yau Lee Wah Concrete Precast Products, Co. Ltd. at Huizhou.

The modules were delivered by land transport from Huizhou to Huangguan Port, and then to the building site. Thirteen articulated vehicles were used per day.

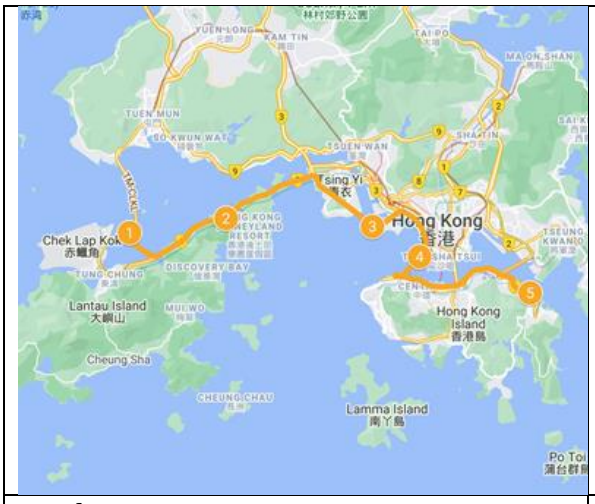
An area nearby was used for temporary storage to achieve just-in-time delivery of the modules.

The delivery commenced in September 2019 and was completed in July 2020. The delivery was made between 0700 hr and 1900 hr.

Five tower cranes with a maximum lifting capacity of 25 tonnes at 19.8 m jib were used. The average operating time for each module lifting and installation is approximately 15 mins.

Figure 16 - Delivery Route of Modules for the FSD Quarters at Pak Shing Kok

6.2.5 Quarantine Facilities at Lei Yue Mun Park and Holiday Village (Sites A and B)



Land Route:	Sea then Land Route:
1) Hong Kong Boundary Crossing Facilities ➔ 2) North Lantau Highway ➔ 3) Tsing Sha Highway ➔ 4) Western Harbour Tunnel ➔ 5) Lei Yue Mun Park and Holiday Village	1) Tuen Mun Pier Head ➔ 2) Tuen Mun Road ➔ 3) Ting Kau Bridge ➔ 4) Tsing Kwai Highway ➔ 5) Western Harbour Tunnel ➔ 6) Central-Wanchai Bypass ➔ 7) Lei Yue Mun Park and Holiday Village

Details:

Steel MiC modules were used. The maximum weight of the steel modules is 16.5 tonnes, and the maximum width is 3.5 m. A total number of 352 modules were used.

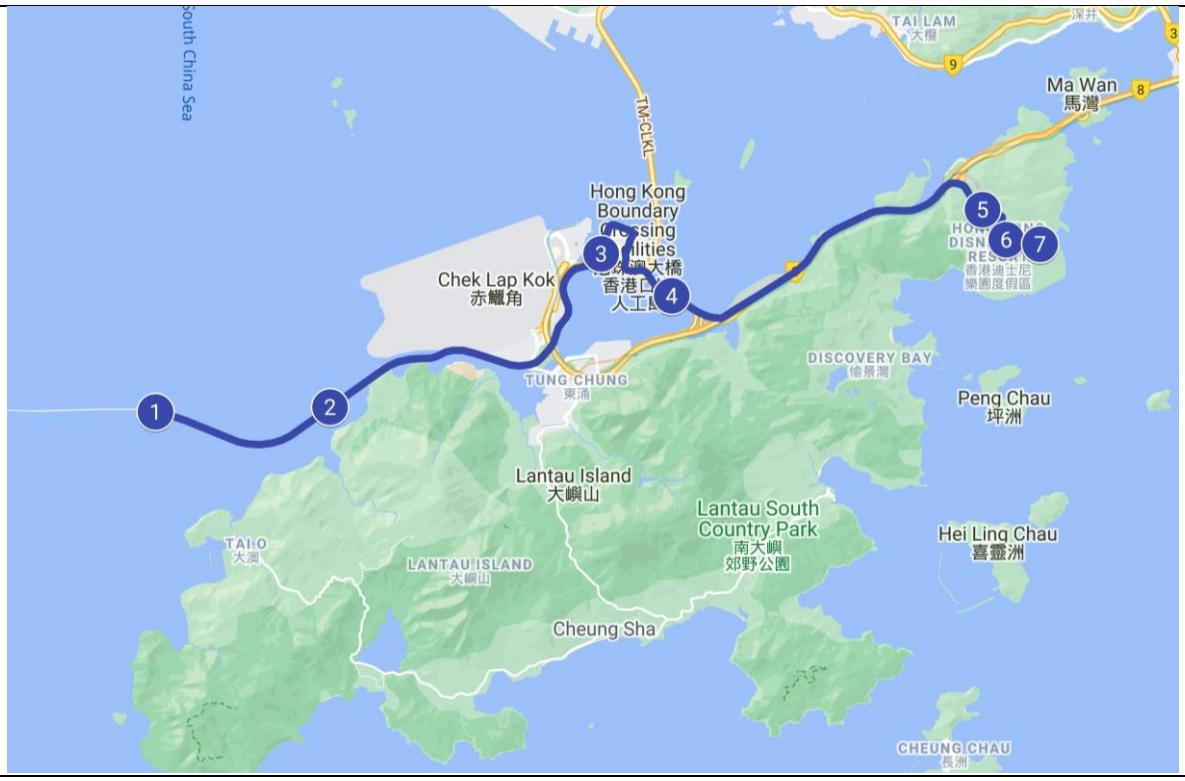
The MiC supplier was China State Hailong Construction Technology Co., Ltd. at Zhuhai.

Two routes were used for delivering the modules. In route 1, the modules were delivered by land transport from Zhuhai to the site via HZMB. In route 2, the modules were delivered by container ship to Tuen Mun Pier Head, and then by land transport to the site via Tuen Mun-Chek Lap Kok Link. The container ship carried 150 modules in on shipment. Articulated vehicles and low bed trailers were used.

The delivery commenced on 8.2.2019 and was completed on 29.4.2019.

Figure 17 - Delivery Route of Modules for Quarantine Facilities at Lei Yue Mun Park and Holiday Village (Sites A and B)

6.2.6 Quarantine Camp at Penny's Bay (Phase 1A)



Land Route:
1) HK-Zhuhai-Macao Bridge ➔2) HK-Zhuhai-Macao Bridge - Hong Kong Link Road ➔ 3) Shun Long Road ➔ 4) North Lantau Highway ➔ 5) Penny's Bay Highway ➔ 6) Fantasy Road ➔ 7) Penny's Bay Quarantine Camp

Details:
The Penny's Bay Quarantine Centre is located at Penny's Bay, occupying an area of 7 hectares (Phase 1). A total of 800 quarantine units were built. The development consists of 2-storey high building units on a 7-hectare site.

For Phase 1A of this project, a total of 110 modules were used. The maximum weight of the module is 11.5 tonnes and the maximum width is 3.0 m. The MiC supplier was Aluhouse at Zhaoqing.

The modules were delivered from the MiC factory at Zhaoqing to the building site via Zhuhai and the HZMB Port.

Four articulated vehicles with a 3-axle low-bed trailer of 12 m long and 1.325 m high were used. The delivery commenced on 14.3.2020 and was completed on 6.4.2020 (23 days). The deliveries were made in between 1000 hr and 1600 hr, and took 5 to 6 hrs from the factory to the site.

One mobile crane with a maximum lifting capacity of 100 tonnes was used to lift the modules. On an average day, 16 modules were delivered and installed on site, and it took on average 20 minutes to lift and install one module.

Figure 18 - Delivery Route of Modules for Quarantine Camp at Penny's Bay (Phase 1A)

6.2.7 Quarantine Camp at Penny's Bay (Phase 1B)

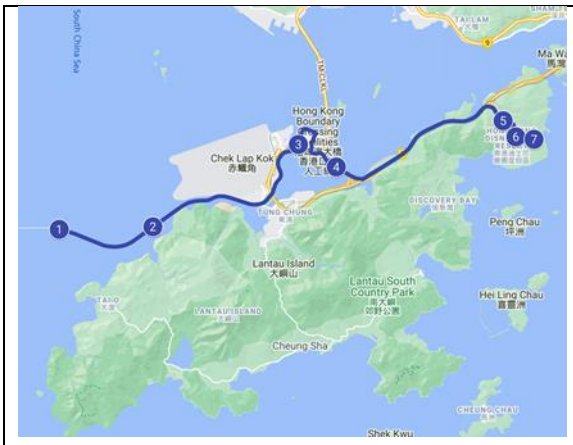
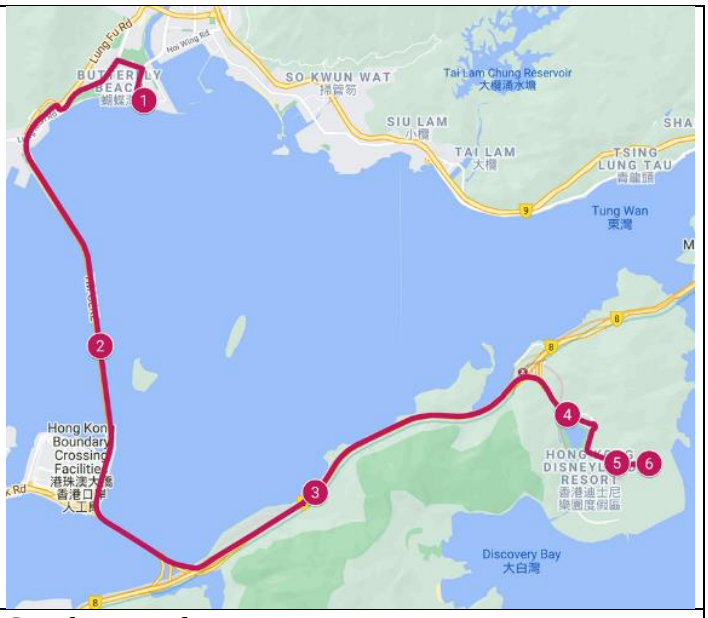
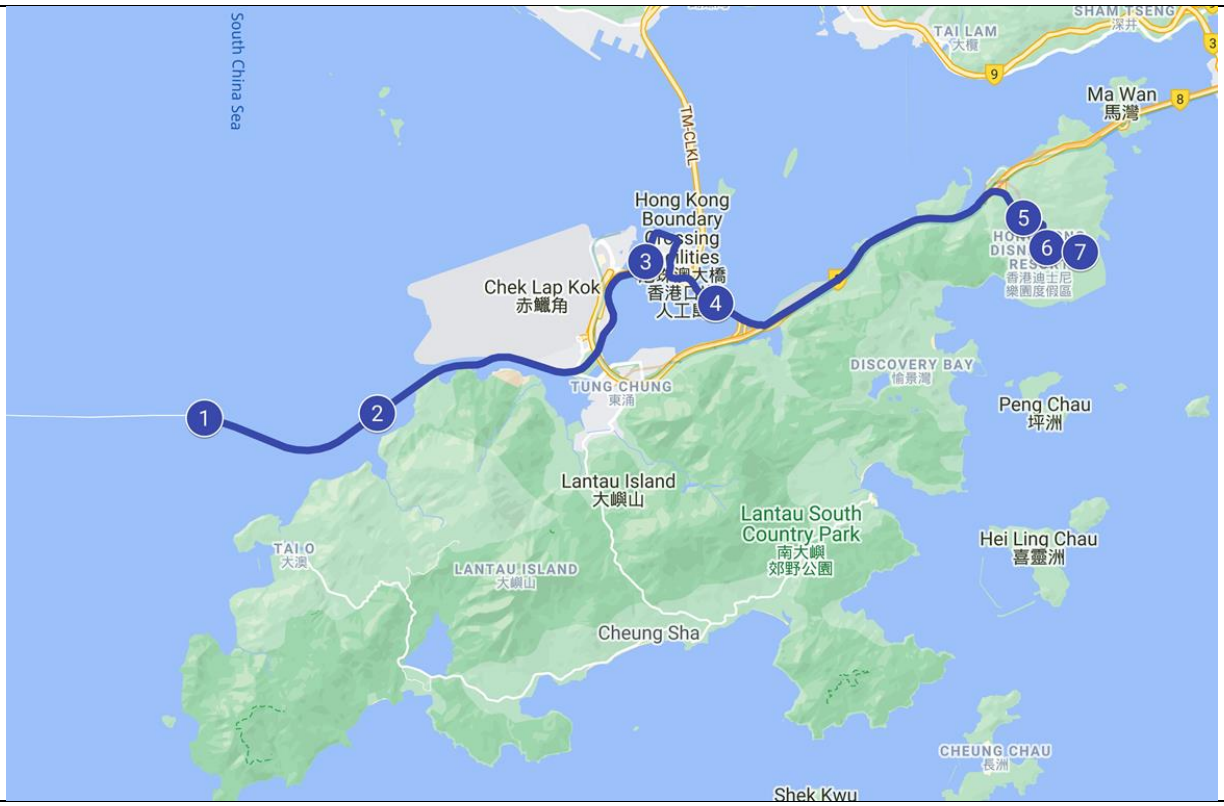
	
Land Route: 1) HK-Zhuhai-Macao Bridge ➔2) HK-Zhuhai-Macao Bridge - Hong Kong Link Road ➔ 3) Shun Long Road ➔ 4) North Lantau Highway ➔ 5) Penny's Bay Highway ➔ 6) Fantasy Road ➔ 7) Penny's Bay Quarantine Camp	Sea then Land Route: 1) Tuen Mun Pier Head ➔ 2) Tuen Mun ➔ 3) Chek Lap Kok Tunnel Road ➔ 4) North Lantau Highway ➔ 5) Penny's Bay Highway Fantasy Road ➔ 6) Penny's Bay Quarantine Camp
Details: Steel and concrete MiC modules were used. The maximum weight of the steel modules and concrete modules is 10 tonnes and 13.5 tonnes respectively, and the maximum width is 3.025 m. A total number of 1546 modules were used. The MiC supplier was China State Hailong Construction Technology Co., Ltd. at Zhuhai. Two routes were used for delivering the modules. In route 1, the modules were delivered by land transport from Zhuhai to the site via HZMB. In route 2, the modules were delivered by container ship to Tuen Mun Pier Head, and then by land transport to the site via Tuen Mun-Chek Lap Kok Link. The container ship carried 150 modules in on shipment. Articulated vehicles and low bed trailers were used. The delivery commenced on 24.5.2020 and was completed on 6.7.2020.	

Figure 19 - Delivery Route of Modules for Quarantine Camp at Penny's Bay (Phase 1B)

6.2.8 Quarantine Camp at Penny's Bay (Phase 2)



Land Route:

1) Hong Kong–Zhuhai–Macao Bridge ➔ 2) Hong Kong–Zhuhai–Macao Bridge Hong Kong Link Road ➔ 3) Shun Long Road ➔ 4) North Lantau Highway ➔ 5) Penny's Bay Highway ➔ 6) Fantasy Road ➔ 7) Penny's Bay Quarantine Camp

Details:

A total of 707 steel MiC modules were used. The maximum weight of the module is 11.5 tonnes and the maximum width is 3.0 m.

The MiC supplier was Aluhouse Co., Ltd. at Zhaoqing.

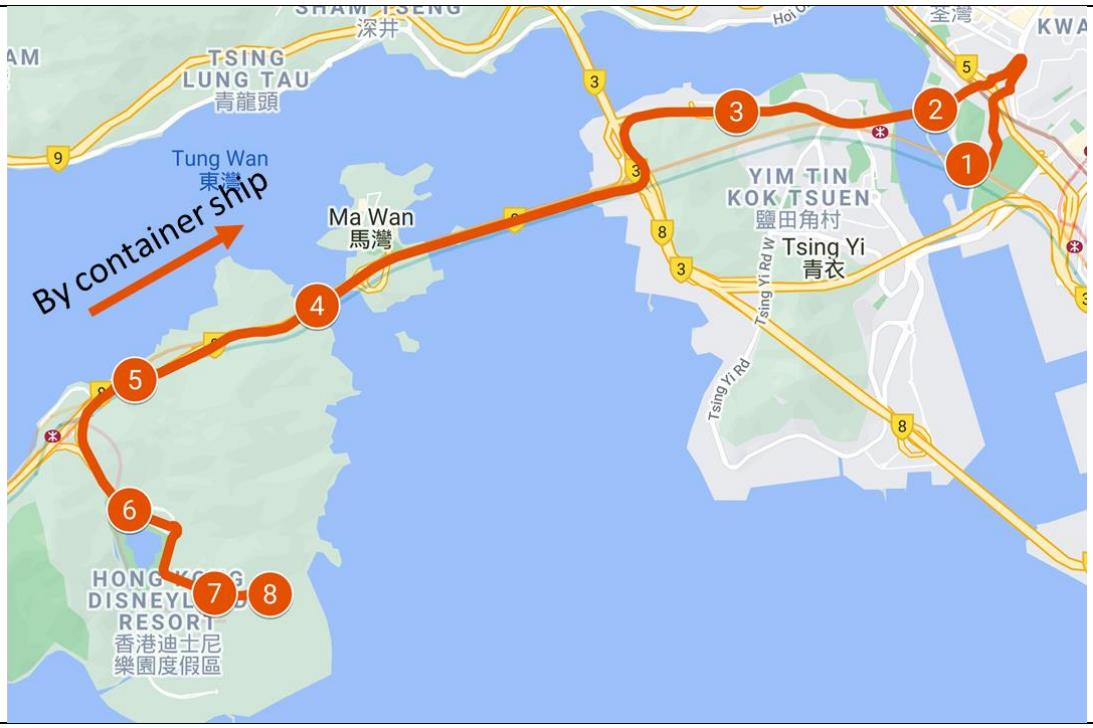
The modules were delivered by land transport from Zhaoqing to the site via HZMB. Ten articulated vehicles and low bed trailers were used.

The delivery commenced on 26.7.2020 and was completed on 26.8.2020.

Two mobile cranes with a maximum lifting capacity of 13.5 tonnes at 16 m jib were used. The average operating time for each module lifting and installation is approximately 25 mins.

Figure 20 - Delivery Route of Modules for the Quarantine Camp at Penny's Bay (Phase 2)

6.2.9 Quarantine Camp at Penny's Bay (Phase 3A)



Sea then Land Route:
1) Rambler Channel Public Cargo Working Area ➔ 2) Tsing Tsuen Road ➔ 3) Tsing Yi North Coastal Road ➔ 4) Lantau Link ➔ 5) North Lantau Highway ➔ 6) Penny's Bay Highway ➔ 7) Fantasy Road ➔ 8) Penny's Bay Quarantine Camp

Details:
A total of 901 steel MiC modules were used. The maximum weight of the module is 13 tonnes and the maximum width is 3.0 m.

The MiC supplier was Guangdong CIMC Building Co., Ltd. at Jiangmen.

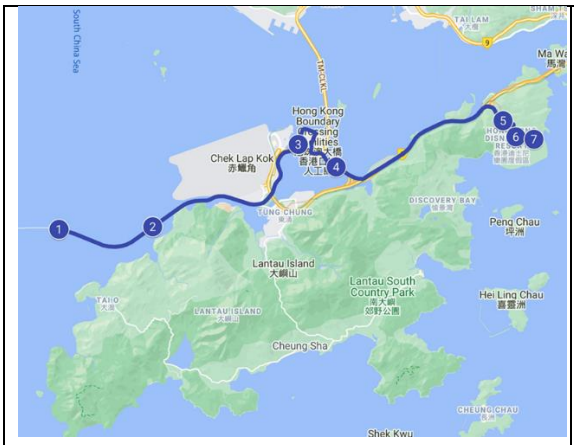
The modules were delivered by container ship to the Rambler Channel PCWA, and then by land transport to the site. The container ship carried 44 modules in on shipment. Twenty articulated vehicles and low bed trailers were used.

The delivery commenced on 1.10.2020 and was completed on 7.11.2020.

Two mobile cranes with a maximum lifting capacity of 14 tonnes at 16 m jib were used. The average operating time for each module lifting and installation is approximately 15 to 20 mins.

Figure 21 - Delivery Route of Modules for the Quarantine Camp at Penny's Bay (Phase 3A)

6.2.10 Quarantine Camp at Penny's Bay (Phase 3B)

<table>
<tr>
<td> 
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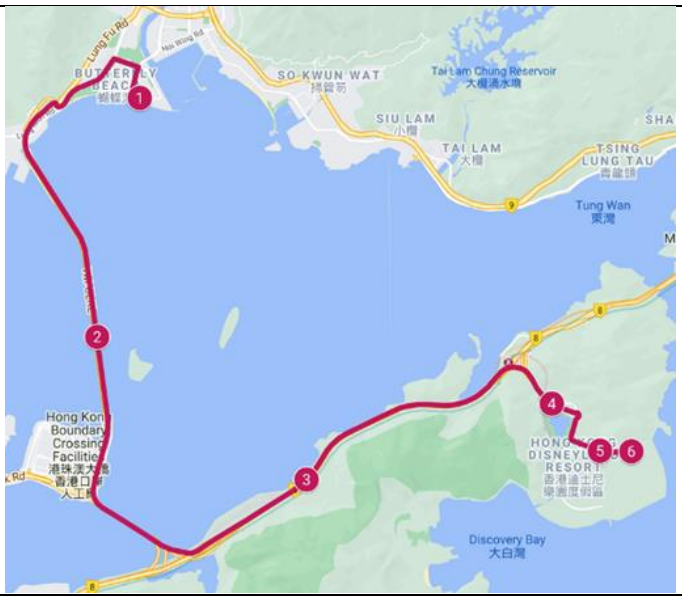
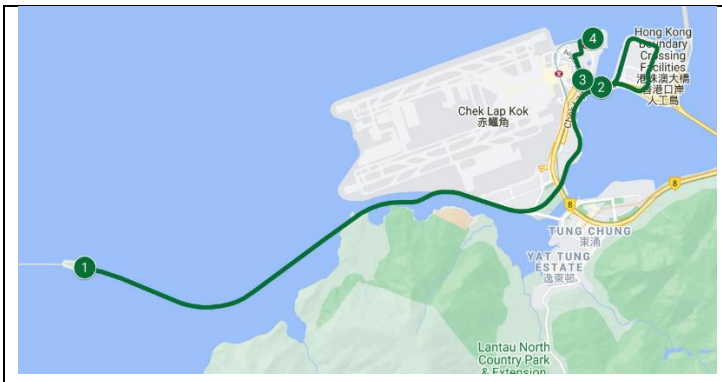
<td> 
</td>
</tr>
<tr>
<td>Land Route:
1) HK-Zhuhai-Macao Bridge ➔ 2) HK-Zhuhai-Macao Bridge - Hong Kong Link Road ➔ 3) Shun Long Road ➔ 4) North Lantau Highway ➔ 5) Penny's Bay Highway ➔ 6) Fantasy Road ➔
7) Penny's Bay Quarantine Camp</td>
<td>Sea then Land Route:
1) Tuen Mun Pier Head ➔ 2) Tuen Mun Chek Lap Kok Tunnel Road➔ 3) North Lantau Highway ➔ 4) Penny's Bay Highway ➔ 5) Fantasy Road ➔
6) Penny's Bay Quarantine Camp</td>
</tr>
<tr>
<td colspan="2">Details:
Steel and concrete MiC modules were used. The maximum weight of the steel modules and concrete modules is 10 tonnes and 13.5 tonnes respectively, and the maximum width is 3.3 m. A total number of 2089 modules were used.

The MiC supplier was China State Hailong Construction Technology Co., Ltd. at Zhuhai.

Two routes were used for delivering the modules. In route 1, the modules were delivered by land transport from Zhuhai to the site via HZMB. In route 2, the modules were delivered by container ship to Tuen Mun Pier Head, and then by land transport to the site via Tuen Mun-Chek Lap Kok Link. The container ship carried 150 modules in on shipment. Articulated vehicles and low bed trailers were used.

The delivery commenced on 20.9.2020 and was completed on 26.10.2020.</td>
</tr>
<tr>
<td colspan="2">Figure 22 - Delivery Route of Modules for Quarantine Camp at Penny's Bay (Phase 3B)</td>
</tr>
</table>

6.2.11 North Lantau Hospital Hong Kong Infection Control Centre at Lantau

<table>
<tr>
<td> 
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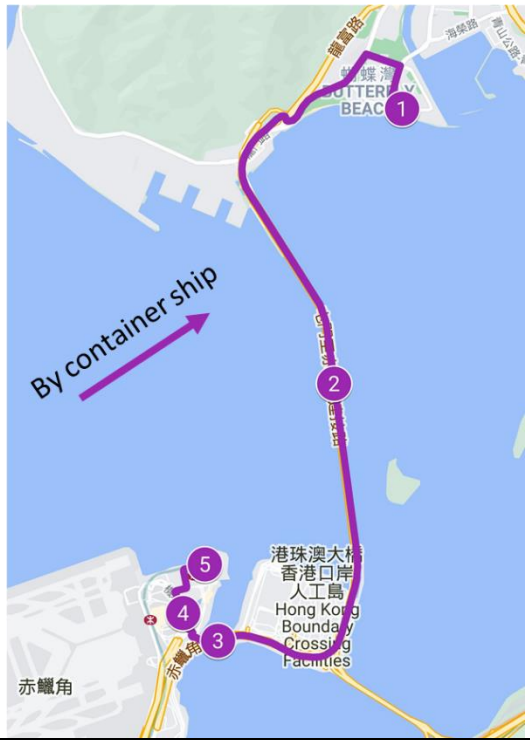
<td> 
</td>
</tr>
<tr>
<td>Land Route:
1) Hong Kong–Zhuhai–Macau Bridge Hong Kong Link Road ➔ 2) Chek Lap Kok Road ➔ 3) SkyCity Road ➔ 4) North Lantau Hospital Hong Kong Infection Control Centre</td>
<td>Sea then Land Route:
1) Tuen Mun Pier Head ➔2) Tuen Mun Chek Lap Kok Tunnel Road ➔ 3) Chek Lap Kok Road ➔ 4) Sky City Road ➔ 5) North Lantau Hospital Hong Kong Infection Control Centre</td>
</tr>
<tr>
<td colspan="2">Details:
Steel MiC modules were used. The maximum weight of the module is 24.4 tonnes and the maximum width is 2.980 m.

The MiC supplier was China State Hailong Construction Technology Co., Ltd. at Zhuhai.

Two routes were used for delivering the modules. In route 1, the modules were delivered by land transport from Zhuhai to the site via HZMB. In route 2, the modules were delivered by container ship to Tuen Mun Pier Head, and then by land transport to the site via Tuen Mun-Chek Lap Kok Tunnel Road. The container ship carried 9 modules in on shipment. Articulated vehicles and low bed trailers were used.

The delivery commenced on 24.10.2020 and was completed on 23.11.2020.

Twelve mobile cranes with a maximum lifting capacity of 20 tonnes at 22.5 m jib were used. The average operating time for each module lifting and installation is approximately 30 mins.</td>
</tr>
<tr>
<td colspan="2">Figure 23 - Delivery Route of Modules for the North Lantau Hospital Hong Kong Infection Control Centre at Lantau</td>
</tr>
</table>

6.3 Discussions

The following observations were made from the logistics arrangement of the eight MiC projects:

(a) The maximum width of the modules used for the projects, except the CIExpo 2019, is 3.1 m. Self-arranged escort vehicles were arranged in most cases. Articulated vehicles with low-bed trailers were commonly used.

(b) The average lifting and installation time for each module is 25 to 35 mins for steel modules and 30 to 45 mins for concrete modules for a 16 to 17-storey high building (i.e. Innocell at Tai Po and FSD Quarters at Pak Shing Kok).

(c) About 10 to 12 for steel modules and 1 to 4 for concrete modules were installed per day for a 16 to 17-storey high building.

(d) A mid-stream site (Yuen Fat Port) and a PCWA (Rambler Channel) were used for unloading of modules from the barges and container ship respectively.

(e) The maximum capacity of the tower crane used for a 16 to 17-storey high building is 25 tonnes at 19.8m jib and 27 tonnes at 25m jib for the concrete and steel modules respectively.

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APPENDIX A – WIDTH OF ROADS IN HONG KONG

In Hong Kong, roads are classified based on the areas they serve (PlanD, 2018). In urban areas (including Hong Kong, Kowloon and New Towns), the road hierarchy comprises: (a) expressways and trunk roads, (b) primary distributor roads, (c) district distributor roads, and (d) local distributor roads. In rural areas, the road hierarchy comprises: (a) expressways and trunk roads (same classification in urban areas), (b) rural roads A, (c) rural roads B, (d) feeder roads; and (e) single track access roads.

A summary of the road widths for different road types in Hong Kong is given in the Table A.1 below.

Table A.1 - Minimum Carriageway Widths in Hong Kong[27]

Road type	**Urban Areas**		**Road type**	**Rural Areas**	
	***Single Carriageway*#**	***Dual Carriageway****		***Single Carriageway***	***Dual Carriageway***
Expressway and Trunk Road	-	7.3 m (2-lane) 11.0 m (3-lane) 14.6 m (4-lane)	**Expressway and Trunk Road**	-	7.3 m (2-lane) 11.0 m (3-lane) 14.6 m (4-lane)
Primary Distributor Road	-	6.75 m (2-lane) 10.0 m (3-lane) 13.5 m (4-lane)	**Rural Road A**	7.3 m (2-lane) 10.3 m (3-lane)	7.3 m (2-lane)
District Distributor Road	7.3 m (2-lane) 10.3 m (3-lane) 13.5 m (4-lane)	6.75 m (2-lane) 10.0 m (3-lane)	**Rural Road B**	6.75 m (2-lane) 10.3 m (3-lane)	7.3 m (2-lane)
Local Distributor Road	7.3 m (2-lane) 10.3 m (3-lane) 13.5 m (4-lane)	6.75 m (2-lane)	**Feeder Road**	6.0 m (2-lane)	-
			Single Track Access Road	3.5 m (1-lane)	-
				Widened to 6 m at passing bays	
				6.0 m (2-lane)	-

Note: #A single carriageway is a road with only one lane in each direction without central divider.
*A dual carriageway is a road for traffic in two directions with a dividing strip between the traffic in opposite directions and with usually two or more lanes in each direction.

[27] Tables 1 & 4 of Chapter 8 of HKPSG (https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/pdf/ch8.pdf).

APPENDIX B – LIST OF MIC SUPPLIERS OF MIC SYSTEMS/COMPONENTS PRE-ACCEPTED BY THE BUILDINGS DEPARTMENT

Type	Count	No. on Map in the Greater Bay Area	BD's Acceptance Reference No. & MiC Projects	MiC Supplier (See Note)	Location
Steel	1	O1	MiC 1/2018	Unitised Building (Hong Kong) Investment Limited and Unitised Building (Shanghai) Building Technology Company Limited	Shanghai
Steel	2	1	MiC 2/2018	Aluhouse Co. Ltd.	Zhaoqing
Steel	3	2	MiC 3/2018	Guangdong CIMC Building Construction Co. Ltd.	Jiangmen
Steel	4	3	MiC 4/2018	Nova Deko Modular Building Co. Ltd.	Foshan
Steel	5	O2	MiC 2/2019	Moderna Homes (HK) Limited	Zhangjiagang City, Jiangsu
Steel	6	4	MiC 4/2019	Nova Techoy Modular Construction Company Limited	Foshan
Steel	7	5	MiC 1/2020	China State Hailong Construction Technology Co. Ltd.	Foshan
Steel	8	O3	MiC 2/2020	Paul Y. - iMax Ltd.	Changshu, Jiangsu
Steel	9	6	MiC 4/2020	Aggressive Construction Company Limited	Nanshan, Shenzhen
Steel	10	7	MiC 5/2020	Paul Y. - iMax Ltd.	Foshan
Steel	11	12	MiC 6/2020	CR Construction Company Limited	Foshan
Steel	12	4	MiC 8/2020	Nova Techoy Modular Construction Company Limited	Foshan
Steel	13	13	MiC 9/2020	Chevalier (Construction) Co., Ltd.	Zhongshan
Steel	14	5	MiC 10/2020	China State Hailong Construction Technology Co. Ltd.	Foshan
Steel	15	8	MiC 11/2020	Yau Lee Wah Concrete Precast Products Co. Ltd.	Huizhou
Steel	16	14	MiC 12/2020	Unistress Building Construction Limited	Baiyun
Steel	17	4	MiC 14/2020	Nova Techoy Modular Construction Company Limited	Foshan
Steel	18	7	MiC 19/2020	Paul Y. - iMax Ltd.	Foshan
Steel	19	13	MiC 20/2020	Chevalier (Construction) Co., Ltd.	Zhongshan
Steel	20	17	MiC 1/2021	Brilliant (Man Sau) Engineering Ltd.	Dongguan
Steel	21	O4	MiC 2/2021	CNQC Intelligent Construction (HK) Limited	Zhangjiagang, Jiangsu
Steel	22	19	MiC 8/2021	i-Box Modular Housing Limited	Huizhou
Steel	23	24	MiC 10/2021	Chinney Construction Co., Ltd.	Foshan
Steel	24	25	MiC 11/2021	Chun Wo Construction & Engineering Co., Ltd.	Foshan
Steel	25	O3	MiC 12/2021	Paul Y. - iMax Ltd.	Changshu, Jiangsu
Steel	26	26	MiC 13/2011	Markbox Limited	Foshan
Concrete	1	8	MiC 1/2019	Yau Lee Wah Concrete Precast Products Co. Ltd.	Huizhou
Concrete	2	9	MiC 3/2019	Shunde Lunjiao Quon Hing Construction Material Co. Ltd.	Foshan
Concrete	3	10	MiC 3/2020	Orientfunds Precast Ltd.	Dongguan
Concrete	4	O5	MiC 7/2020	Chun Wo Construction & Engineering Co., Ltd.	Johor, Malaysia
Concrete	5	15	MiC 13/2020	Wing Hong Shun Enterprises Limited	Huizhou
Concrete	6	16	MiC 15.2020	China State Hailong Construction Technology Co. Ltd.	Zhuhai
Concrete	7	8	MiC 16/2020	Yau Lee Wah Concrete Precast Products Co. Ltd.	Huizhou
Concrete	8	18	MiC 17/2020	Unistress Building Company Limited	Huizhou
Concrete	9	19	MiC 18/2020	i-Box Modular Housing Limited	Huizhou
Concrete	10	20	MiC 21/2020	Urban Renewal Authority	Huizhou
Concrete	11	21	MiC 3/2021	Techoy Construction Company Limited	Huizhou
Concrete	12	22	MiC 4/2021	Aggressive Construction Company Limited	Huizhou
Concrete	13	23	MiC 5/2021	Gammon Construction Limited	Huizhou
Concrete	14	8	MiC 6/2021	Yau Lee Wah Concrete Precast Products Co. Ltd.	Huizhou
Concrete	15	16	MiC 7/2021	China State Hailong Construction Technology Co. Ltd.	Zhuhai
Concrete	16	O5	MiC 9/2021	Chun Wo Construction & Engineering Co., Ltd.	Johor, Malaysia
Concrete	17	27	MiC 14/2021	Shui On Conctruction Company Limited	Zhuhai
Concrete	18	28	MiC 15/2021	Dragages Hong Kong Limited	Shenzhen & Dongguan
Concrete	19	29	MiC 16/2021	Unistress Building Construction Limited	Huizhou
Concrete	20	30	MiC 17/2021	Paul Y. Modular Integrated Construction Limited	Dongguan

MiC Project	1	11	MiC Display Centre	CIMC	Jiangmen
MiC Project	2	1 11	CIExpo2019 at Wanchai	Paul Y./ China State Hailong Construction Technology Co. Ltd./ CIMC/ Aluhouse Co. Ltd.	Dongguan Foshan
MiC Project	3	11	Innoell	CIMC	Jiangmen
MiC Project	4	8	FSD Quarters at Pak Shing Kok	Yau Lee Wah Concrete Precast Products Co. Ltd.	Huizhou
MiC Project	5	16	Quarantine Facilities at Lei Yue Mun Park and Holiday Village (Sites A and B)	China State Hailong Construction Technology Co. Ltd.	Zhuhai
MiC Project	6	1	Quarantine Camp at Penny's Bay (Phase 1A)	Aluhouse Co. Ltd.	Zhaoqing
MiC Project	7	16	Quarantine Camp at Penny's Bay (Phase 1B)	China State Hailong Construction Technology Co. Ltd.	Zhuhai
MiC Project	8	1	Quarantine Camp at Penny's Bay (Phase 2)	Aluhouse Co. Ltd.	Zhaoqing
MiC Project	9	2	Quarantine Camp at Penny's Bay (Phase 3A)	Guangdong CIMC Building Construction Co. Ltd.	Jiangmen
MiC Project	10	16	Quarantine Camp at Penny's Bay (Phase 3B)	China State Hailong Construction Technology Co. Ltd.	Zhuhai
MiC Project	11	16	North Lantau Hospital Hong Kong Infection Control Centre	China State Hailong Construction Technology Co. Ltd.	Zhuhai

Note:

1. Based on the details given in the BD's List of Pre-accepted MiC Systems/Components (as of 8.12.2021) and those of the Completed MiC Projects.
2. Those MiC Suppliers with their factories located outside the Greater Bay Area are marked Yellow.

APPENDIX C – CONTACTS OF ROAD MANAGEMENT OFFICE

Road Management Office	Address	Telephone	Fax Number
Road Management Office (HK Island) Enforcement & Control Division, Traffic HK Island, HK Island Regional HQs	Room 304, 3/F., Happy Valley Police Station, Hong Kong	28355278	28034783
Road Management Office (Kowloon West) Enforcement & Control Division, Traffic Kowloon West, Kowloon West Regional HQs	Room 208, 2/F., Traffic Kowloon West Operational Base, 8 Wai Wan Lane, Hung Hom, Kowloon	27735240	23997659
Road Management Office (Kowloon East) Enforcement & Control Division, Traffic Kowloon East, Kowloon East Regional HQs	1/F., Kowloon East Operational Base, 2 Siu Yip Street, Kowloon Bay, Kowloon	27553515	27504456
Road Management Office (New Territories South) Enforcement & Control Division, Traffic New Territories South, New Territories South Regional HQs	Room 1, G/F., E&C Block, New Territories South Operational Base, 4 Castle Peak Road, Tsuen Wan, New Territories	26113388	24151636
Road Management Office (New Territories North) Enforcement & Control Division, Traffic New Territories North, New Territories North Regional HQs	G/F., Tai Hing Operational Base, 80 Tsun Wen Road, Tuen Mun, New Territories.	24677793	24634236
Traffic Management and Prosecutions Bureau, Traffic Branch HQs	32/F, Arsenal House, Police Headquarters, No.1, Arsenal Street, Wan Chai, Hong Kong	28606263	22004377

APPENDIX D – DETAILS OF PROJECTS

No.	Project	Contractor	MiC Supplier	Traffic Consultant	Logistics Company	Module Type	Max. Width (mm)	Max. Length (mm)	Max. Height (mm)	Max. Weight (tonnes)	Trial Run	Self-arranged Escort Vehicles	Temp. Loading Bay, contingency parking, etc.	Provision of 1st Gantry (Width)	Provision of 2nd Gantry (Width)	Vehicle Type	Trailer Type	Barge Type
1	MiC Display Centre at Kowloon Bay (10 modules)	-	CIMC	-	JES Logistics Ltd.	Steel	4500	7240	3300	NA	N	Y	Y	-	-	Articulated Vehicles	Low-bed	96T Barge (To Yuen Fat Port)
2	CIExpo2019 at Wanchai (10 modules)	-	Paul Y./ China State Hailong Construction Technology Co. Ltd./ CIMC/ Aluhouse Co. Ltd.	-	-	Steel	3440	8680	3.3	13.5	N	Y	N	-	-	Articulated Vehicles	6-axle, 10-11m long Low-bed	-
3	Innocell at Tai Po (418 modules)	Hip Hing Engineering Co. Ltd.	CIMC	MVA Hong Kong Ltd. & Mannings	Ah Ngau Engineering Ltd. & Kanson Crane & Heavy Transport. Co., Ltd.	Steel	3100	7350 (9560*)	3050	NA	Y	Y	Y	Y (7.5m)	Y (7.5m)	5 Medium Goods Vehicles	-	Barge (To Yuen Fat Port)
4	FSD Quarters at Pak Shing Kok (3726 modules)	Yau Lee Construction Co. Ltd.	Yau Lee Wah Concrete Precast Products Co., Ltd.	Meinhardt Infrastructure & Environment Ltd.	Yau Lee Wah Concrete Precast Products Co., Ltd.	Concrete	2525	5460	3300	17	N	N	Y	Y	Y	Articulated Vehicles	3-axle, 9 & 12m long, 1.55m high Flat-bed/3-axle, 10m long, 1m high Low-bed	-
5	Quarantine Facilities at Lei Yue Mun Park and Holiday Village (Sites A and B) (352 modules)	China State Construction Engineering (HK) Ltd.	China State Hailong Construction Technology Co. Ltd.	Ho Wang SPB Ltd.	Profit Logistics (International) Ltd.	Steel	3500	8000	3020	16.5	N	Y	N	N	N	Articulated Vehicles	4-axle, 12m long, 0.8m high & 3-axle, 10m long, 0.8m high Low-bed	Container Ship (To Tuen Mun Pier Head)
6	Quarantine Camp at Penny's Bay (Phase 1A) (110 modules)	-	AluHouse Co. Ltd.	-	Ming Jun Heavy Transport Co., Ltd.	Hybid	3000	6000	3000	11.5	N	N	N	N	N	4 Articulated Vehicles	3-axle, 12m long, 1.325m high Low-bed	-
7	Quarantine Camp at Penny's Bay (Phase 1B) (1546 modules)	China State Construction Engineering (HK) Ltd.	China State Hailong Construction Technology Co. Ltd.	Ho Wang SPB Ltd.	Profit Logistics (International) Ltd.	Steel & Concrete	2980	8150	3025	13.5	N	Y	N	N	N	Articulated Vehicles	4-axle, 12m long, 0.8m high & 3-axle, 10m long, 0.8m high Low-bed	Container Ship (To Tuen Mun Pier Head)
8	Quarantine Camp at Penny's Bay (Phase 2) (707 modules)	Gammon Construction Ltd.	AluHouse Co. Ltd.	MVA Hong Kong Ltd.	Crown Link Asia Construction Ltd.	Steel	3000	6000	3160	11.5	N	N	N	Y	N	10 Articulated Vehicles	6-axle, 16m long, 1.645m high Flat-bed	-

No.	Project	Contractor	MiC Supplier	Traffic Consultant	Logistics Company	Module Type	Max. Width (mm)	Max. Length (mm)	Max. Height (mm)	Max. Weight (tonnes)	Trial Run	Self-arranged Escort Vehicles	Temp. Loading Bay, contingency parking, etc.	Provision of 1st Gantry (Width)	Provision of 2nd Gantry (Width)	Vehicle Type	Trailer Type	Barge Type
9	Quarantine Camp at Penny's Bay (Phase 3A) (901 modules)	Hip Hing Engineering Co. Ltd.	Guangdong CIMC Building Construction Co. Ltd.	-	Chi Kan Woodworks Co., Ltd.	Steel	3000	12192	3848	13	Y	Y	N	Y (6m)	N	20 Articulated Vehicles	5-axle, 12.5m long, 0.7m high Low-bed	Container Ship (To Rambler Channel PWCA)
10	Quarantine Camp at Penny's Bay (Phase 3B) (2089 modules)	China State Construction Engineering (HK) Ltd.	China State Hailong Construction Technology Co. Ltd.	Ho Wang SPB Ltd.	Profit Logistics (International) Ltd.	Steel & Concrete	2980	12000	3025	13.5	N	Y	N	N	N	Articulated Vehicles	4-axle, 12m long, 0.8m high & 3-axle, 10m long, 0.8m high Low-bed	Container Ship (To Tuen Mun Pier Head)
11	North Lantau Hospital Hong Kong Infection Control Centre at Lantau	China State Construction Engineering (HK) Ltd.	China State Hailong Construction Technology Co. Ltd.	Ho Wang SPB Ltd.	Profit Logistics (International) Ltd.	Steel	2980	9980	3905	24.4	N	Y	N	N	N	Articulated Vehicles	4-axle, 12m long, 0.8m high & 3-axle, 10m long, 0.8m high Low-bed	Container Ship (To Tuen Mun Pier Head)
	Notes:		1. * Including corridor and AC platform 2. - denotes Not appliable 3. NA denotes Not available															

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Feedback Form

Reference Materials - Logistics and Transport for MiC Projects (December 2021)

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Informative	❑	❑	❑	❑	❑
Comprehensive	❑	❑	❑	❑	❑
Useful	❑	❑	❑	❑	❑
Practical	❑	❑	❑	❑	❑
2. Does this publication enable you to understand more about the Logistics and Transport for MiC Projects?	Yes		No	No Comment	
	❑		❑	❑	
3. Have you made reference to this publication in your work?	Quite Often		Sometimes	Never	
	❑		❑	❑	
4. To what extent have you incorporated the recommendations of this publication in your work?	Most		Some	None	
	❑		❑	❑	
5. Overall, how would you rate this publication?	Excellent	Very Good	Satisfactory	Fair	Poor
	❑	❑	❑	❑	❑
6. Other comments and suggestions (please specify and use separate sheets if necessary).					

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