CONSTRUCTION
INDUSTRY COUNCIL
建造業議會

SURVEY ON THE POTENTIAL UTILISATION OF PREFABRICATION YARDS IN HONG KONG - SURVEY REPORT

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Version 1
August 2017

Survey on the Potential Utilisation of Prefabrication Yards in Hong Kong

- Survey Report -

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Enquiries

Any enquiries regarding the Survey Report may be made to the CIC Secretariat at:

CIC Headquarters
38/F, COS Centre,
56 Tsun Yip Street,
Kwun Tong, Kowloon
Hong Kong

Tel: (852) 2100 9000
Fax: (852) 2100 9090
Email: enquiry@cic.hk
Website: www.cic.hk

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1 EXECUTIVE SUMMARY

INTRODUCTION

To seek better understanding of different stakeholders towards the potential of utilising prefabrication in the construction industry, Mercado Solutions Associates Ltd. (MSA) was commissioned by the Construction Industry Council (CIC) to conduct this survey. During the data collection period from July to September 2016, a total of 648 stakeholders in different sectors were successfully enumerated by means of self-administered questionnaire survey and telephone / face-to-face interview (incl. 21 employers (i.e. government departments, public utility and private developers), 121 consulting companies and 506 contractors). This summary highlights the major findings of the survey.

SUMMARY OF SURVEY FINDINGS

Current Situation of Utilising Prefabrication

Incidence of using prefabricated components in construction projects in the past 2 years

Of all enumerated establishments, 24.5% used prefabricated components in construction projects in the past 2 years before enumeration. Such proportion was higher among employers (57.1%), followed by consulting companies (28.1%) and contractors (22.3%).

From the expert interviews, most of the respondents said prefabricated components tended to be used in public projects more extensively and frequently. The major reason is that the design and building form in public projects are more standard, meaning that it is more economy for applying prefabrication construction method. On the other hand, some respondents claimed that there are more variations and last minute changes in the process of private construction projects, thus might not suitable to adopt prefabrication construction method.

Types of prefabricated components which were ever used

Among those which used, the top category of prefabricated components which were used was concrete works (47.2%; i.e. 11.6% among all enumerated establishments), followed by ductwork (35.8%), steel works (27.7%), pipework (25.2%) and other types (e.g. window components, electrical works, wooden works, etc.) (26.4%).

From the expert interviews, many respondents said usage of prefabricated components for steel works, pipework, ductwork and other types of work are less common, because they needed early planning and coordination between architects, structural engineers and building services engineers, which required more time and less flexible than traditional cast-insitu building method.

Country / region from which the prefabricated components were manufactured

Among those which used the respective types of prefabricated components, the majority said the components were manufactured in Mainland China (94.7% among those which used prefabricated components for concrete works; 90.9% for steel works; 67.5% for pipework; 80.7% for ductwork and 92.9% for other types of work). It was noteworthy that among those which used prefabricated components for steel works (34.1%), pipework (47.5%) and ductwork (36.8%), considerable proportions used components which were produced in Hong Kong.

From the expert interviews, virtually all respondents said the prices from suppliers in Mainland China were much lower than those in other countries / region. Yet, they also mentioned some drawbacks of using suppliers In Mainland China, including: inconvenient for monitoring, sometimes dissatisfactory quality and sometimes having problems in clearing the customs.

Benefits of using prefabricated components in construction projects

The most frequently mentioned benefit of using prefabricated components in construction projects was “simplify work process / shorten project time” (85.3% among those which used prefabricated components for concrete works; 84.1% for steel works; 85.0% for pipework; 73.7% for ductwork and 64.3% for other types of work). Other common mentions include “stability of quality”, “enhance environmental protection (e.g. reduce wastage of materials)”, “relieve shortage of labour” and “to free up space for other on-site activities”.

Cost effectiveness of using prefabricated components in construction projects

In terms of cost-effectiveness of using prefabricated components (i.e. financial investment vs. the desired outcome) in construction projects, the majority of those which used the respective types of prefabricated components considered that it is very / quite effective (81.3% among those which used prefabricated components for concrete works; 88.6% for steel works; 90.0% for pipework; 86.0% for ductwork and 97.6% for other types of work), whilst those who had negative views accounted for less than 11% respectively.

Intention of Utilising Prefabrication in the Future

Of all enumerated establishments, 38.1% claimed that they would continue using / plan to use prefabricated components in the future (increased 13.6% as compared with 24.5% in the past 2 years). Still, such proportion was relatively higher among employers (85.7%), followed by consulting companies (59.5%) and contractors (31.0%).

Analyzing by the respective types of prefabricated components, more establishments claimed that they would continue using / plan to use prefabricated components for concrete works (19.9%; vs. 11.6% in the past 2 years, increased by 8.3%), followed by steel works (12.7%; vs. 6.8% in the past 2 years), ductwork (14.5% vs. 5.7%) and pipework (11.1% vs. 6.2%).

On the other hand, among those which claimed that they would not consider to use prefabricated component in the future, most of them considered that prefabrication construction method cannot be applicable in their projects (64.8%) (e.g. those which involved in interior fitting out projects, electrical works, air-conditioning installation, demolition, etc.). Besides, some said it was because it is difficult to make changes on the design during the construction process (16.2%), and some thought that it cannot guarantee good quality (11.0%) and/or cannot lower the construction cost (10.0%).

Views on Developing Local Prefabrication Yards

Whether considered helpful to the development of construction industry if HK were to develop local prefabrication yards

Of the enumerated establishments which would use prefabricated components in the future, they were introduced the examples in Singapore and Hong Kong for developing local prefabrication yards.

When asked whether they considered helpful to the development of construction industry if Hong Kong were to develop local prefabrication yards, the majority of those which would use the respective types of prefabricated components considered it very / quite helpful (78.3% for concrete works; 80.5% for steel works; 79.2% for pipework; 79.8% for ductwork and 85.7% for other types of work). Conversely, those which considered not quite / not helpful accounted for less than 17% respectively.

From the expert interviews, respondents expressed their opinions on the strengths and

weaknesses of Hong Kong in developing local prefabrication yards. The major strengths are: "located in Hong Kong thus better monitoring", "recognition of testing and certification" and "more flexible in making changes". The major weaknesses are: "higher labour and land cost", "limited land supply" and "hard to find investors due to long time of investment return".

Factors of consideration in using locally produced prefabricated components

It was noteworthy that among those which would use the respective types of prefabricated components in the future, only small proportions claimed that they will not consider using local production (below 12%). For those which will consider, apart from price, the top 3 factors of consideration in using locally produced prefabricated components are "lower transportation cost of the prefabricated components" (about 38% - 58%), "QC is done locally" (about 36% - 50%) and "better communication with local vendor (e.g. about product design, time of delivery, etc.)" (about 30% - 59%).

Reasons for not considering to use any locally produced prefabricated components

Among those establishments which would use the respectively types of prefabricated components in the future, yet they would not consider using local production, virtually all said they worried that the price is higher (100% for concrete works; 66.7% for steel works; 80.0% for pipework; 100% for ductwork and 80.0% for other types).

Strategies for Encouraging Wider Adoption of Prefabrication Construction Method

Ways to encourage the industry to use prefabricated components more widely

Of all enumerated establishments, when asked about the ways to encourage the industry to use prefabricated components more widely, relatively more suggested to enhance industry involvement by organising more exhibitions and show the end products where possible (51.5%), followed by enhancing industry understanding by organising more talks / seminars. Comparatively speaking, fewer establishments suggested providing economic incentives by setting up trust fund for subsidising consultancy fee (37.7%) and/or by releasing plot ratio in land requirements (34.0%).

Usage of prefabricated components in relation to BEAM

Survey results showed that the usage of prefabricated components is highly correlated to BEAM, as establishments tended to use prefabricated components (used in the past 2 years

and would use in the future) more among those which were aware of BEAM, those which have ever applied BEAM Plus and those which have ever submitted materials to fulfill BEAM Plus Prefabrication requirements.

CONCLUSION & RECOMMENDATIONS

Prefabricated components tended to be used in public projects more extensively and frequently, as the design and building form in public projects are more standard.

The top category of prefabricated components which were used was concrete works. The usage of prefabricated components for steel works, pipework, ductwork and other types of work are less common, because they needed early planning and coordination, which required more time and less flexible than traditional cast-insitu building method.

The major source of prefabricated components was Mainland China, for which the prices were much lower than those in other countries / region. Yet, the drawbacks of using suppliers in Mainland China include: inconvenient for monitoring, sometimes dissatisfactory quality and sometimes having problems in clearing the customs.

Establishments which would use prefabricated components in the future generally supported Hong Kong in developing local prefabrication yards, as most of them considered that it is helpful to the development of construction industry, and only few of them claimed that they will not consider using locally produced prefabricated components.

As price is the key barrier for establishments to consider using local production, and industry professionals in the expert interviews also mentioned that the main weakness of Hong Kong is the high labour cost and land rental cost, the Government is recommended to consider providing supportive measures for reducing the operating cost of local prefabrication yards (e.g. supply of land at low rental cost, subsidies for labour cost, etc.), such that the price of local production can be more competitive.

In addition, as mentioned by some respondents, quality assurance of the prefabrication yards in Mainland China varied between different suppliers. Quality control is also one of the major factors of consideration in using produced prefabricated components. Therefore, if local prefabrication yards can perform better in this aspect and provide repair and maintenance services after sales, this will be the one of the strengths of Hong Kong.

Furthermore, respondents also recognised other advantages of local yards, including lower transportation cost, confident with the testing and certification results in Hong Kong, and more flexible in making changes due to better and closer communication with local suppliers.

Further studies in the following key areas are recommended:

- Quantifying the potential demand such that it is justify for the input of resources in developing local prefabrication yards;
- Exploring the essential factors for developing local prefabrication yards, including land supply, technological requirements, relevant talents for operating the prefabrication plants in Hong Kong, etc.;
- Investigating the impact on the existing local labour market.

Finally, for promoting wider adoption of prefabrication, the Government or relevant parties are suggested to organise more exhibitions, talks and seminars, on the one hand to enhance industry knowledge, and on the other hand to give more opportunities for potential investors of local prefabrication yards in promoting their products and services.

2 BACKGROUND & SURVEY OBJECTIVES

To collect the opinions from industry stakeholders of the construction industry towards the application of precast components, and to assess the feasibility of establishing local prefabrication yards in Hong Kong, so as to review and formulate future strategies with this context, Mercado Solutions Associates Ltd. (MSA) was commissioned by the Construction Industry Council (CIC) to conduct this survey. This report documents the findings of the survey.

Specifically, the objectives of the survey are:

- To have a better understanding of the current situation of utilizing prefabrication in the local construction industry;
- For the industry stakeholders who did not use prefabrication in their construction projects in the past 2 years, to identify if they are willing to adopt prefabrication method and are ready to switch their current practice;
- To collect the views from industry stakeholders about establishing local prefabrication yard and their potential utilization; and
- To identify their factors of consideration in using prefabrication / precast components produced by local prefabrication yard.

The target groups for the survey are:

- Employers (i.e. government departments, public utility and private developers)
- Consulting companies (e.g. companies providing architectural, engineering and surveying services, etc.)
- Contractors

3 METHODOLOGY

3.1 QUANTITATIVE SURVEY

An integrated electronic and mailed self-administered questionnaire was used to conduct the survey. A telephone enquiry hotline was also set up to handle enquiries throughout the survey period.

Self-administered questionnaires were mailed to the 3 target groups of establishments. The electronic version was also sent to the email accounts (if available) of the target respondents / the organisations. Respondents could choose to return their completed questionnaires by post, fax, email or via the online questionnaire. Follow-up calls and visits were made for reminding them of the survey, and telephone and face-to-face interviews were conducted with them if necessary.

In total, 648 completed questionnaires were collected between July and September 2016. The enumeration results from the respective stakeholders were:

Stakeholders	(A) No. of questionnaires sent out	(B) No. of invalid cases	(C) No. of returns	Response rate [C / (A – B)] *100%
Employers	181	4	21	11.9%
Consulting companies	381	8	121	32.4%
Contractors	1 500	165	506	37.9%
Total	**2 062**	**177**	**648**	**34.4%**

Based on a total of 648 samples achieved for the survey and the estimated population of 7 832 establishments in the industry, the corresponding level of precision of the survey result was ±3.7% at 95% confidence level.

3.2 QUALITATIVE EXPERT INTERVIEWS

Apart from the above stakeholders, 12 in-depth interviews were conducted with professionals who participated in the decision process of using prefabrication components in construction projects. Their opinions were used to supplement the quantitative survey results. The number of interviews from the respective professional areas were:

Professional areas	**No. of interviews**
Architect	2
Civil / structural engineer	4
Building services engineer	1
Project manager	2
Building / quantity surveyor	3
Total	**12**

4 SURVEY FINDINGS

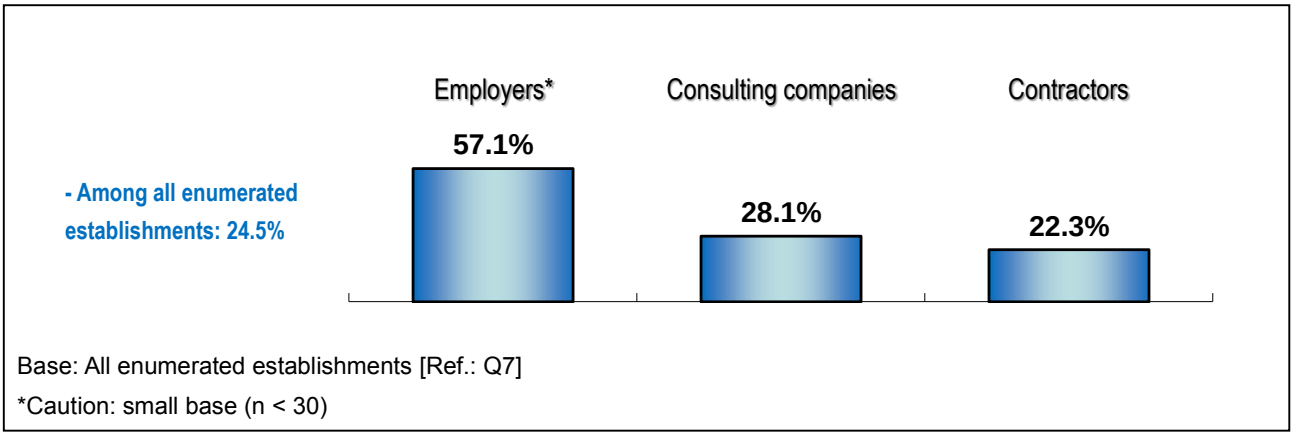
4.1 CURRENT SITUATION OF UTILISING PREFABRICATION

4.1.1 Incidence of Using Prefabricated Components in Construction Projects in the Past 2 Years

Of all enumerated establishments, nearly one-quarter (24.5%) used prefabricated components in construction projects in the past 2 years before enumeration. Such proportion was higher among employers (57.1%; including government departments, public utility and private developers), followed by consulting companies (28.1%) and contractors (22.3%).

(Ref.: Chart 4.1.1a)

Chart 4.1.1a: Incidence of using prefabricated components in construction projects in the past 2 years



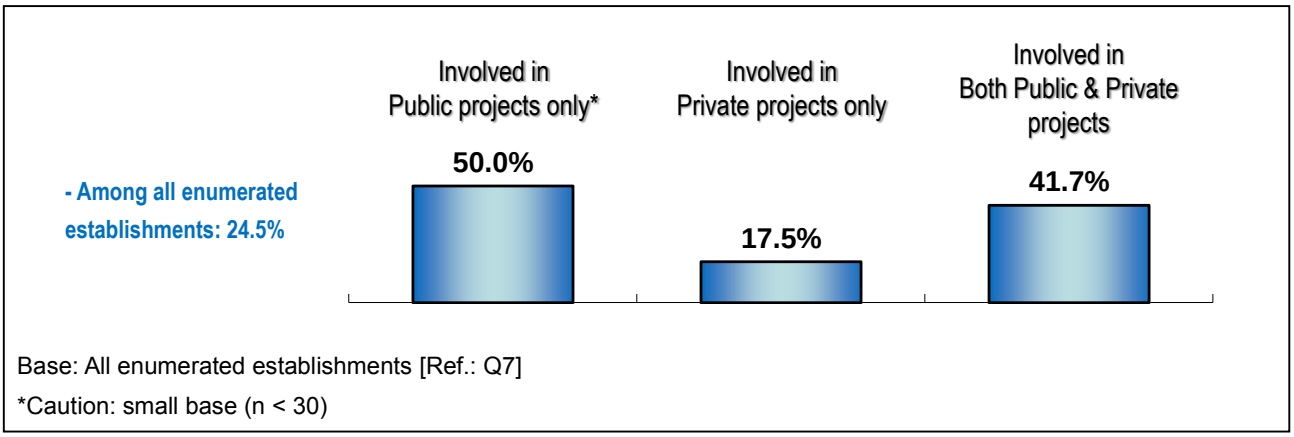
Base: All enumerated establishments [Ref.: Q7]

*Caution: small base (n < 30)

When analyzed by public or private projects that they have been involved in the past 2 years, it was observed that the proportion of those which used prefabricated components was significantly lower among those which involved in private projects only (17.5%), as compared with those which involved in public projects only (50.0%) and those which involved in both public and private projects (41.7%).

(Ref.: Chart 4.1.1b)

Chart 4.1.1b: Incidence of using prefabricated components in construction projects in the past 2 years – analyzed by public or private projects that the enumerated establishments have been involved in the past 2 years



Base: All enumerated establishments [Ref.: Q7]

*Caution: small base (n < 30)

Opinions from Expert Interviews

From the expert interviews, most of the respondents said prefabricated components tended to be used in public projects more extensively and frequently. The major reason is that the design and building form in public projects are more standard, meaning that it is more economy for applying prefabrication construction method. Moreover, there are government policies for promoting environmental friendly measures in construction projects, thus some related requirements were set out in the tender documents of public construction projects, including the use of prefabricated components.

On the other hand, there are more special designs (e.g. featured flats) and irregular building forms in private projects. In addition, some respondents claimed that there are more variations and last minute changes in the process of private construction projects, thus might not suitable to adopt prefabrication construction method.

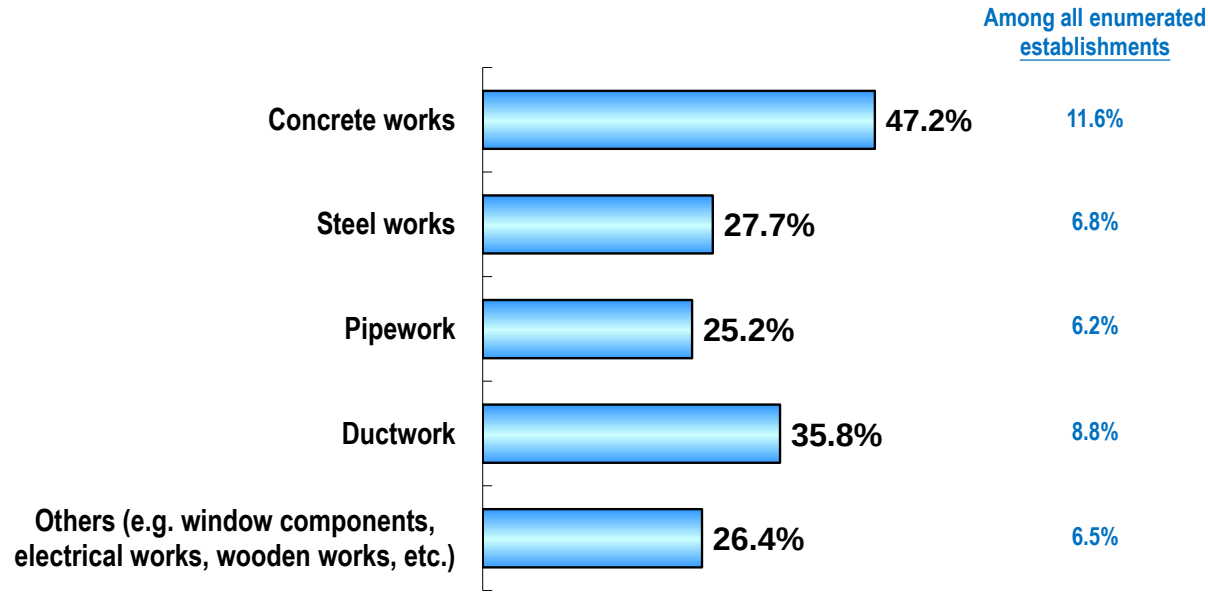
Besides, some respondents said prefabricated components were more commonly used in buildings projects, as compared with other types of projects. While for some other respondents who involved in infrastructural works, they said prefabricated components were also commonly used in port works, road and bridge works, etc.

4.1.2 Types of Prefabricated Components which were Ever Used

Of those enumerated establishments which used prefabricated components in the past 2 years, the top category of prefabricated components which were used was concrete works (47.2%; i.e. 11.6% among all enumerated establishments), followed by ductwork (35.8%) and steel works (27.7%).

(Ref.: Chart 4.1.2)

Chart 4.1.2: Types of prefabricated components which were ever used



Base: All enumerated establishments which used prefabricated components in the past 2 years [Ref.: Q8]

Opinions from Expert Interviews

From the expert interviews, many respondents said usage of prefabricated components for steel works, pipework, ductwork and other types of work are less common, because they needed early planning and coordination between architects, structural engineers and building services engineers, which required more time and less flexible than traditional cast-insitu building method.

Top 5 Prefabricated Components which Have Been Used

Concrete works

- Facade
- Staircase
- Slab
- Partition wall
- Panel

Steel works

- Structural steel
- Bridge segment
- Piles
- Beam
- Staircase

Pipeworks

- Sewage water pipeline
- Pipe elbow
- Pipe conjunction
- Fresh water pipeline
- Gutter

Ductworks

- Duct pipe
- Diffuser
- Air louver
- Pipe conjunction
- Damper

Others

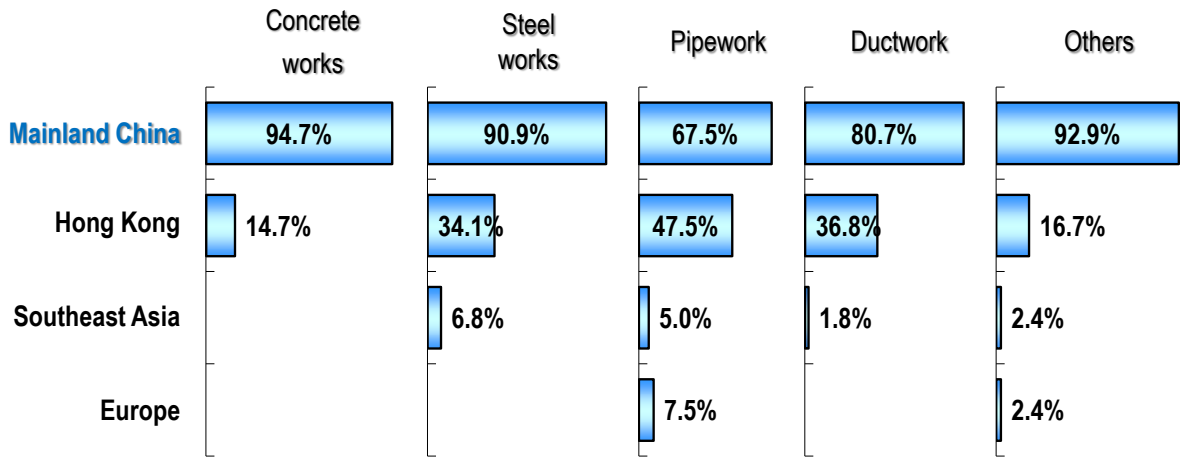
- Window components
- Electrical works
- Wooden works
- Sump pit
- Sewage manhole

4.1.3 Country / Region from which the Prefabricated Components were Manufactured

When asked about the country / region from which the prefabricated components were manufactured, among those which used the respective types of prefabricated components, the majority said the components were manufactured in Mainland China (94.7% among those which used prefabricated components for concrete works; 90.9% for steel works; 67.5% for pipework; 80.7% for ductwork and 92.9% for other types of work). It was noteworthy that among those which used prefabricated components for steel works (34.1%), pipework (47.5%) and ductwork (36.8%), considerable proportions used components which were produced in Hong Kong.

(Ref.: Chart 4.1.3)

Chart 4.1.3: Country / region from which the prefabricated components were manufactured



Base: All enumerated establishments which used the respective types of prefabricated components in the past 2 years [Ref.: Q9]

Opinions from Expert Interviews

From the expert interviews, virtually all respondents said the prices from suppliers in Mainland China were much lower than those in other countries / region. Furthermore, they said many suppliers in Mainland China are large-scaled and experienced in manufacturing prefabricated components that they are able to meet the requirements of Hong Kong construction projects.

Yet, they also mentioned some drawbacks of using suppliers In Mainland China. First, it is inconvenient for monitoring the production. Construction companies in Hong Kong have to deploy full-time employees stationing in Mainland China for monitoring. Secondly, sometimes the quality of produced components was dissatisfactory. Although such

situations were not frequently happened, construction companies in Hong Kong have to reserve extra cost in fixing the defects. Furthermore, sometimes there are problems in clearing the customs. They claimed that even if it is only a few days of delay in delivering the produced components to the construction sites, the impact on allocation of manpower and change of work plan might be large.

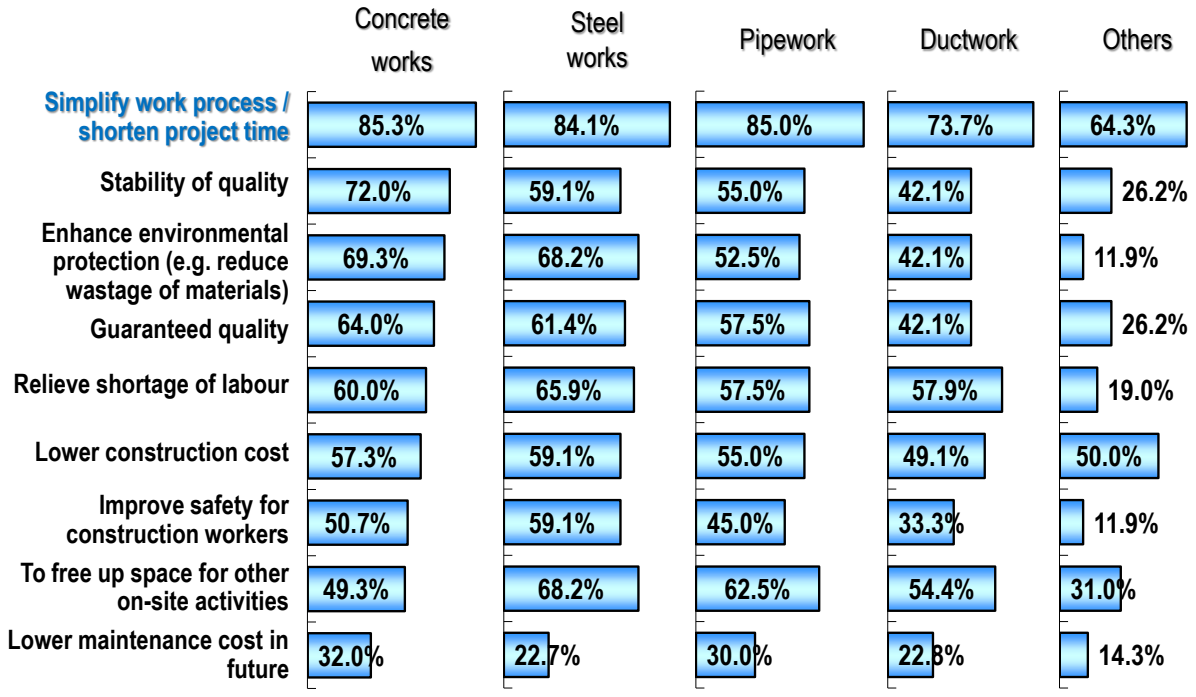
4.1.4 Benefits of Using Prefabricated Components in Construction Projects

For those which used the respective types of prefabricated components, the most frequently mentioned benefit was “simplify work process / shorten project time” (85.3% among those which used prefabricated components for concrete works; 84.1% for steel works; 85.0% for pipework; 73.7% for ductwork and 64.3% for other types of work).

Moreover, among those which used prefabricated components for concrete works, about seven-tenths respectively mentioned the benefits of “stability of quality” (72.0%) and “enhance environmental protection (e.g. reduce wastage of materials)” (69.3%). For steel works, pipework and ductwork, many of those which used said prefabricated components brought the benefits that it “relieve shortage of labour” (about 58% - 66%) and it is able “to free up space for other on-site activities” (about 54% - 68%).

(Ref.: Chart 4.1.4)

Chart 4.1.4: Benefits of using prefabricated components in construction projects



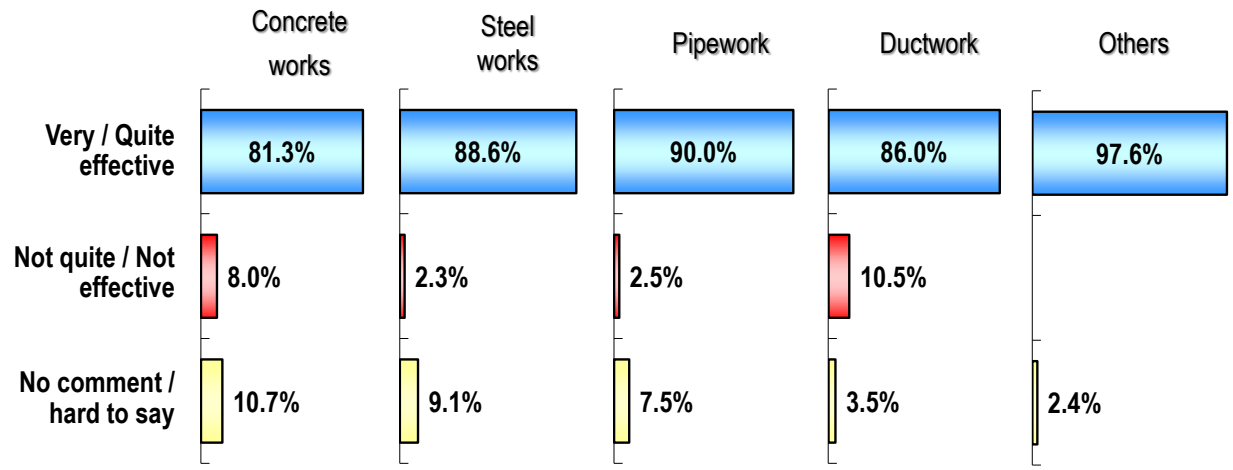
Base: All enumerated establishments which used the respective types of prefabricated components in the past 2 years [Ref.: Q10]

4.1.5 Cost Effectiveness of Using Prefabricated Components in Construction Projects

In terms of cost-effectiveness of using prefabricated components (i.e. financial investment vs. the desired outcome) in construction projects, the majority of those which used the respective types of prefabricated components considered that it is very / quite effective (81.3% among those which used prefabricated components for concrete works; 88.6% for steel works; 90.0% for pipework; 86.0% for ductwork and 97.6% for other types of work). On the contrary, those who had negative views accounted for less than 11% respectively.

(Ref.: Chart 4.1.5)

Chart 4.1.5: Cost effectiveness of using prefabricated components in construction projects



Base: All enumerated establishments which used the respective types of prefabricated components in the past 2 years [Ref.: Q11]

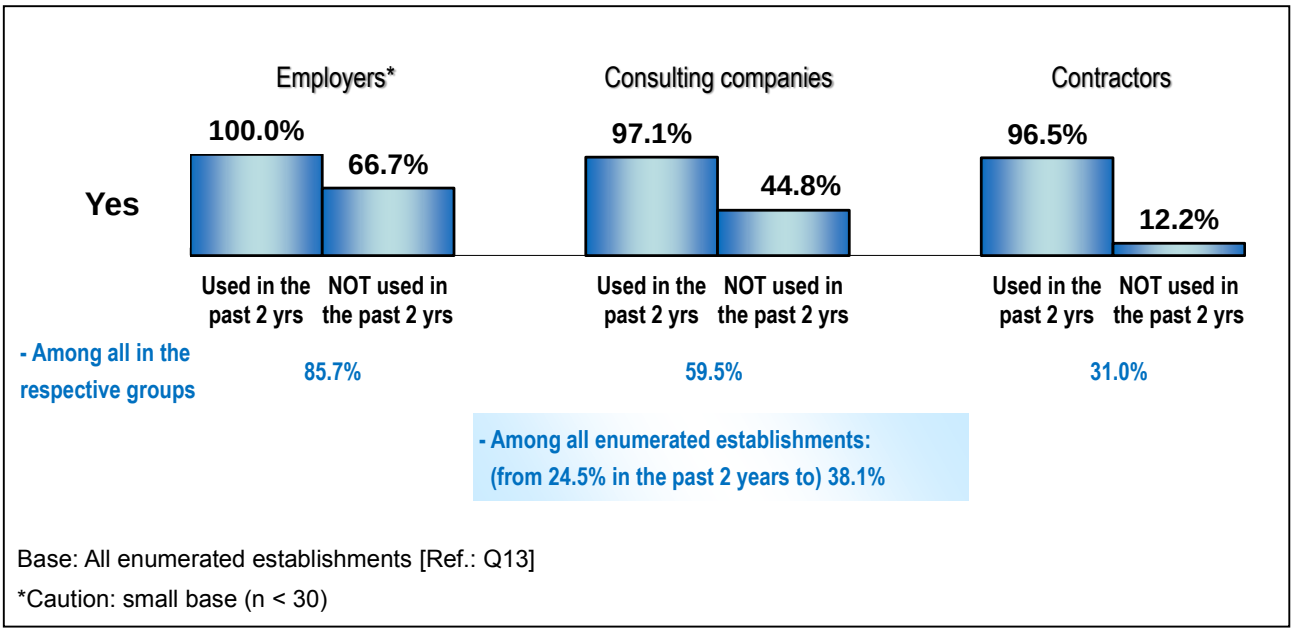
4.2 INTENTION OF UTILISING PREFABRICATION IN THE FUTURE

Of all enumerated establishments, 38.1% claimed that they would continue using / plan to use prefabricated components in the future (increased 13.6% as compared with 24.5% in the past 2 years). Still, such proportion was relatively higher among employers (85.7%), followed by consulting companies (59.5%) and contractors (31.0%).

Virtually all of those which used prefabricated components claimed that they would continue using in the future (100% for employers; 97.1% for consulting companies and 96.5% for contractors). For those which did not used in the past 2 years, relatively higher proportion of employers (66.7%) claimed that they would plan to use (vs. 44.8% for consulting companies and 12.2% for contractors).

(Ref.: Chart 4.2a)

Chart 4.2a: Whether they would continue using / plan to use prefabricated components in the future



Base: All enumerated establishments [Ref.: Q13]

*Caution: small base (n < 30)

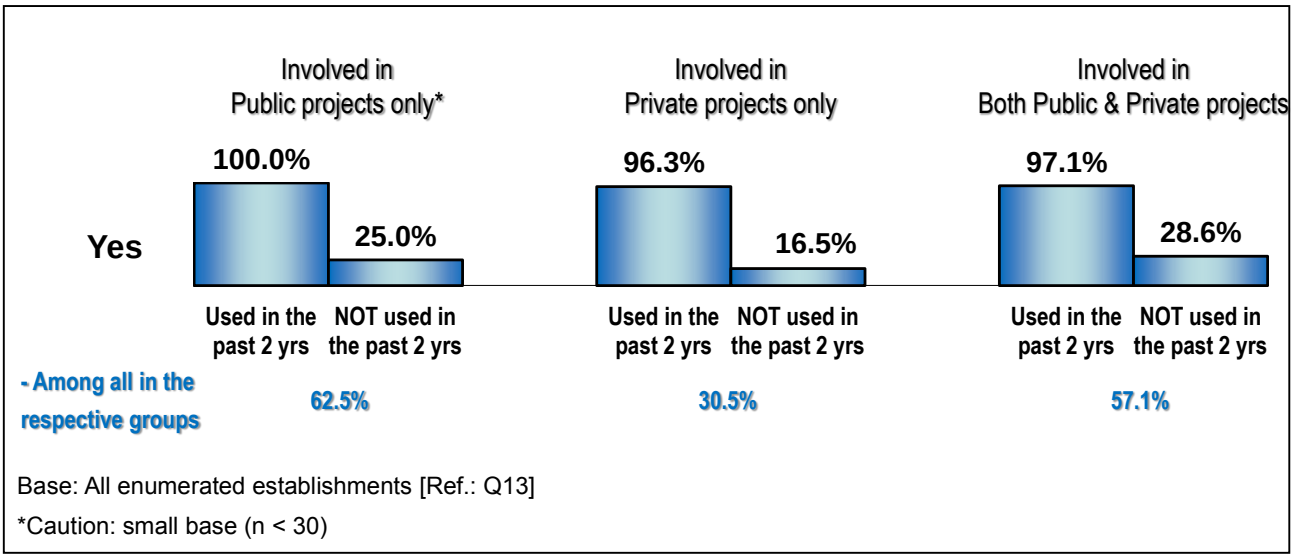
When analyzed by public or private projects that they have been involved in the past 2 years, similar to the incidence of using in the past 2 years, it was also observed that the proportion of those which would continue using / plan to use prefabricated components in the future was relatively lower among those which involved in private projects only (30.5%; vs. 62.5% for those which involved in public projects only and 57.1% for those which involved in both public and private projects).

Analyzing by the respective types of prefabricated components, it was observed that more enumerated establishments claimed that they would continue using / plan to use prefabricated components for concrete works (19.9%; vs. 11.6% in the past 2 years,

increased by 8.3%), followed by steel works (12.7%; vs. 6.8% in the past 2 years), ductwork (14.5% vs. 5.7%) and pipework (11.1% vs. 6.2%).

(Ref.: Charts 4.2b & c)

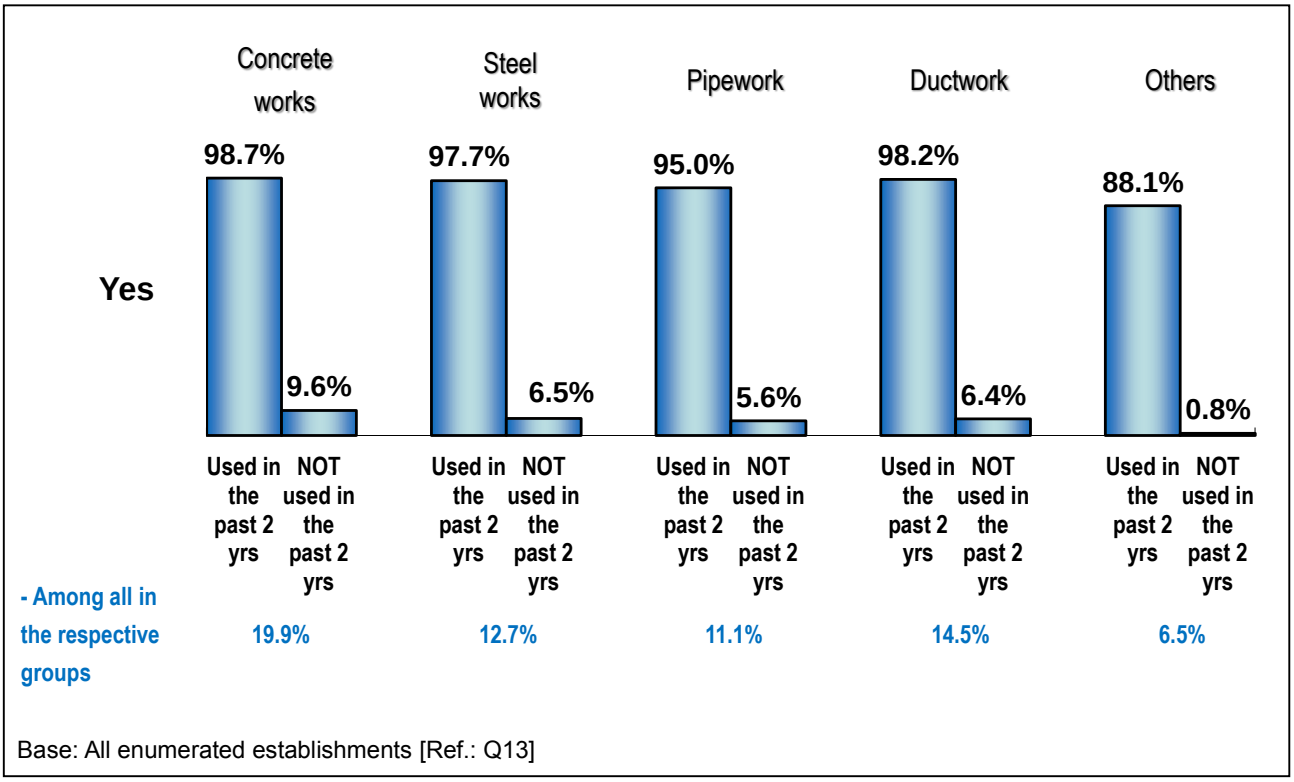
Chart 4.2b: Whether they would continue using / plan to use prefabricated components in the future – analyzed by public or private projects that the enumerated establishments have been involved in the past 2 years



Base: All enumerated establishments [Ref.: Q13]

*Caution: small base (n < 30)

Chart 4.2c: Whether they would continue using / plan to use prefabricated components in the future – analyzed by whether used the respective types of prefabricated components in the past 2 years

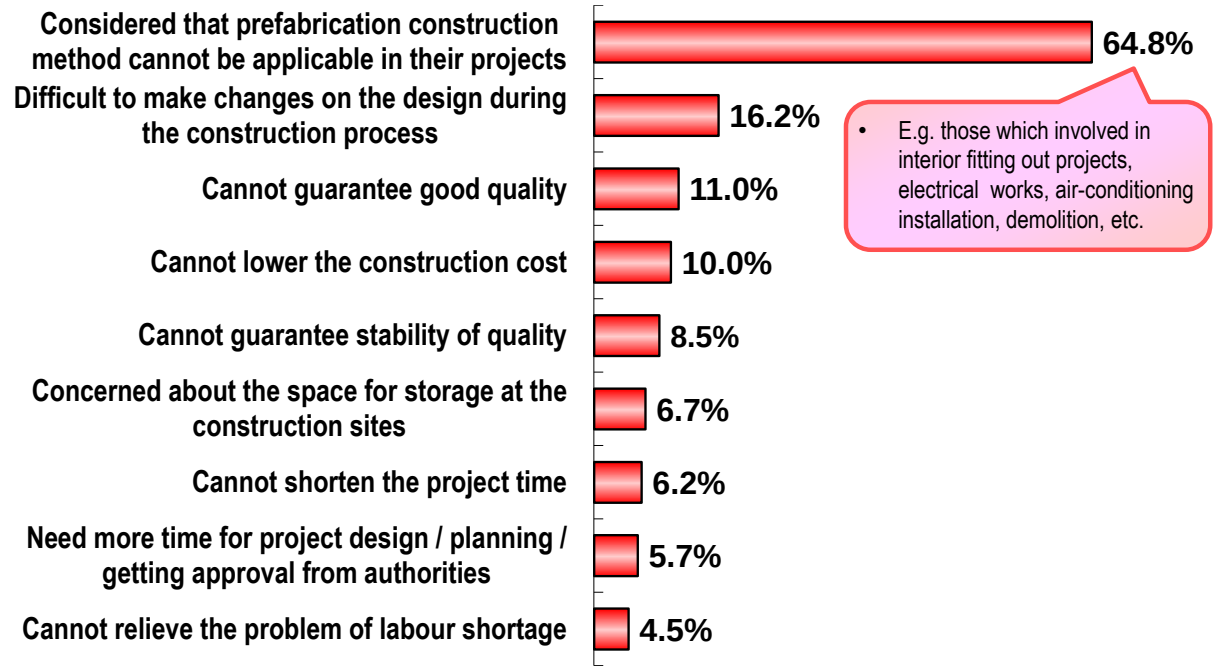


Base: All enumerated establishments [Ref.: Q13]

On the other hand, among those which claimed that they would not consider to use prefabricated component in the future, most of them considered that prefabrication construction method cannot be applicable in their projects (64.8%) (e.g. those which involved in interior fitting out projects, electrical works, air-conditioning installation, demolition, etc.). Besides, some said it was because it is difficult to make changes on the design during the construction process (16.2%), and some thought that it cannot guarantee good quality (11.0%) and/or cannot lower the construction cost (10.0%).

(Ref.: Chart 4.2d)

Chart 4.2d: Reasons for not considering to use any prefabricated components



Base: All enumerated establishments which would not consider to use any prefabricated component in the future [Ref.: Q18]

4.3 VIEWS ON DEVELOPING LOCAL PREFABRICATION YARDS

Of the enumerated establishments which would use prefabricated components in the future, they were introduced the examples in Singapore and Hong Kong for developing local prefabrication yards:

Feasibility of developing local prefabrication yards

Example in Singapore:

In order to enhance productivity and automation for the construction industry, Singapore developed the first pre-cast hub in 2013 for production of different prefabrication components. The hub occupies a total site area of 20,000 square meters in a 5-storey factory producing 25 different types of components.

Example in Hong Kong:

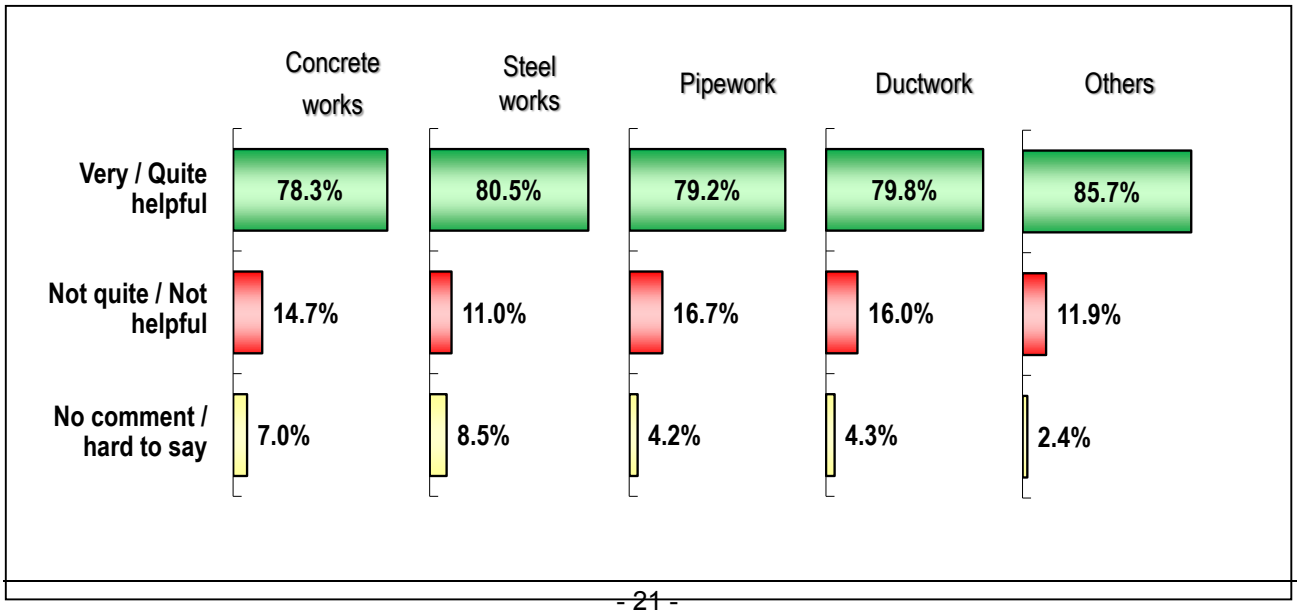
Hong Kong's first highly automated reinforcement steel processing plant for cutting and bending steel reinforcing bars began its operation in January 2016. The plant is located in Tsing Yi with a total site area of 30,000 square meters. It can perform cutting and bending as well as quality control.

4.3.1 Whether Considered Helpful to the Development of Construction Industry if HK were to Develop Local Prefabrication Yards

When asked whether they considered helpful to the development of construction industry if Hong Kong were to develop local prefabrication yards, the majority of those which would use the respective types of prefabricated components considered it very / quite helpful (78.3% for concrete works; 80.5% for steel works; 79.2% for pipework; 79.8% for ductwork and 85.7% for other types of work). Conversely, those which considered not quite / not helpful accounted for less than 17% respectively.

(Ref.: Chart 4.3.1)

Chart 4.3.1: Whether considered helpful to the development of construction industry if HK were to develop local prefabrication yards



Base: All enumerated establishments which would continue using / plan to use the respective types of prefabricated components in the future [Ref.: Q14]

Opinions from Expert Interviews

From the expert interviews, respondents expressed their opinions on the strengths and weaknesses of Hong Kong in developing local prefabrication yards. The common mentions are:

Strengths

- The prefabrication yards will be located in Hong Kong, thus it is better for monitoring the quality of production.
- Recognition of testing and certification results in Hong Kong.
- It is more flexible in making changes (e.g. product design, time of delivery, etc.) due to better and closer communication with local suppliers.

Weaknesses

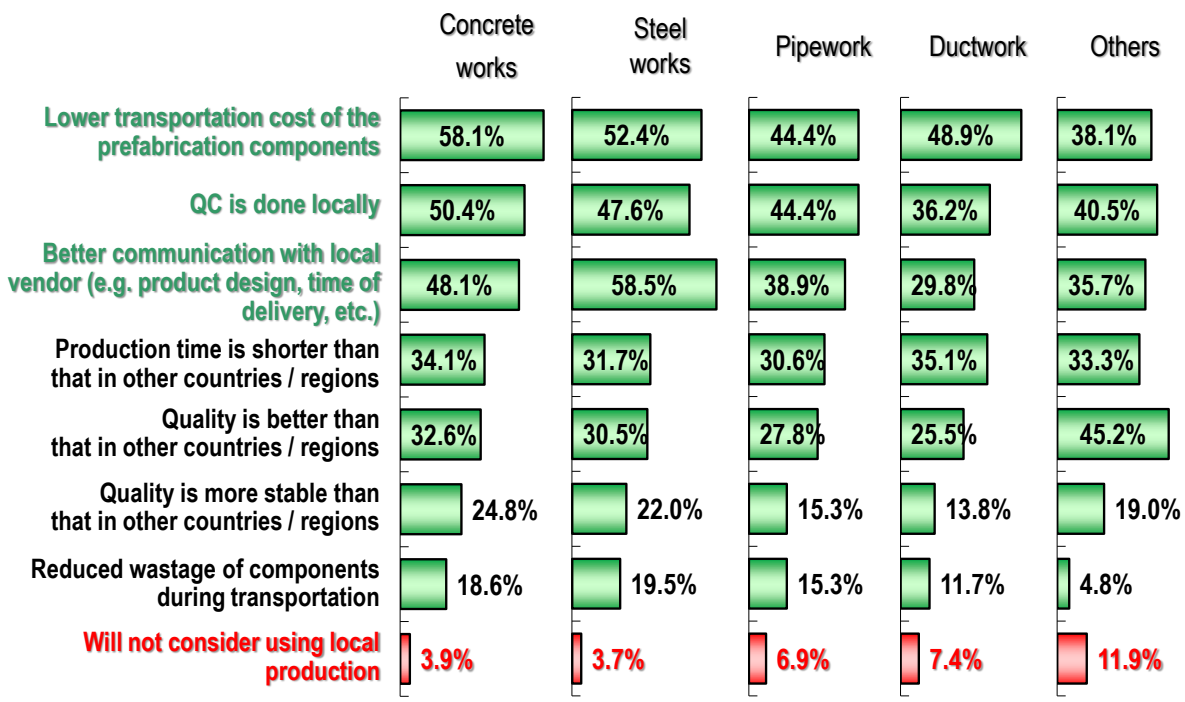
- As labour cost and land rental cost are much higher than that in Mainland China, it implies that price will be higher.
- Developing prefabrication yards involve large areas of land, yet Hong Kong is facing problem in shortage of land supply.
- Due to high amount of investment and long time of investment return, It is hard to find investors for developing local prefabrication yards.

4.3.2 Factors of Consideration in Using Locally Produced Prefabricated Components

It was noteworthy that among those which would use the respective types of prefabricated components in the future, only small proportions claimed that they will not consider using local production (3.9% for concrete works; 3.7% for steel works; 6.9% for pipework; 7.4% for ductwork and 11.9% for other types). For those which will consider, apart from price, the top 3 factors of consideration in using locally produced prefabricated components are "lower transportation cost of the prefabricated components" (about 38% - 58%), "QC is done locally" (about 36% - 50%) and "better communication with local vendor (e.g. about product design, time of delivery, etc.)" (about 30% - 59%).

(Ref.: Chart 4.3.2)

Chart 4.3.2: Factors of consideration in using locally produced prefabricated components



Base: All enumerated establishments which would continue using / plan to use the respective types of prefabricated components in the future [Ref.: Q15]

Top 5 Prefabricated Components for which the Enumerated Establishments Would Consider Using Local Production (nearly the same as those which have been used)

Concrete works

- Facade
- Staircase
- Slab
- Partition wall
- Column

Steel works

- Structural steel
- Staircase
- Beam
- Piles
- Bridge segment

Pipeworks

- Sewage water pipeline
- Pipe elbow
- Fresh water pipeline
- Pipe conjunction
- Gutter

Ductworks

- Duct pipe
- Diffuser
- Air louver
- Damper
- Pipe conjunction

Others

- Window components
- Electrical works
- Wooden works
- Sump pit
- Sewage manhole

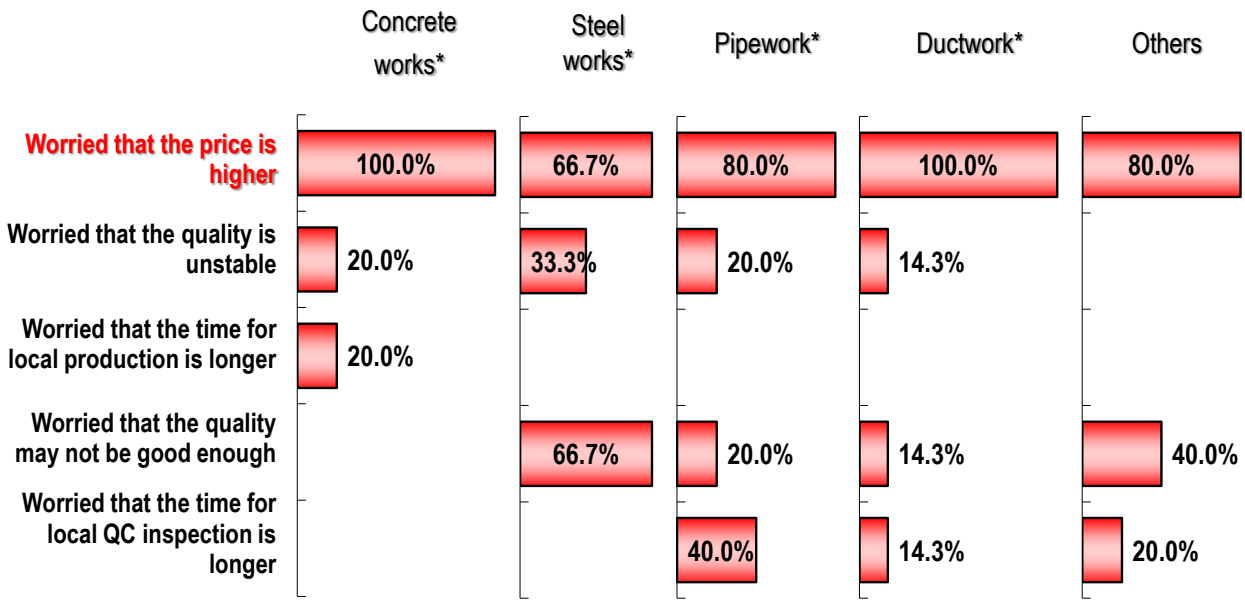
4.3.3 Reasons for Not Considering to Use any Locally Produced Prefabricated

Components

Among those establishments which would use the respectively types of prefabricated components in the future, yet they would not consider using local production, virtually all said they worried that the price is higher (100% for concrete works; 66.7% for steel works; 80.0% for pipework; 100% for ductwork and 80.0% for other types).

(Ref.: Chart 4.3.3)

Chart 4.3.3: Reasons for not considering to use any locally produced prefabricated components



Base: All enumerated establishments which would continue using / plan to use prefabricated components in the future, Yet would not consider using locally produced prefabricated components [Ref.: Q17]

*Caution: small base (n < 30)

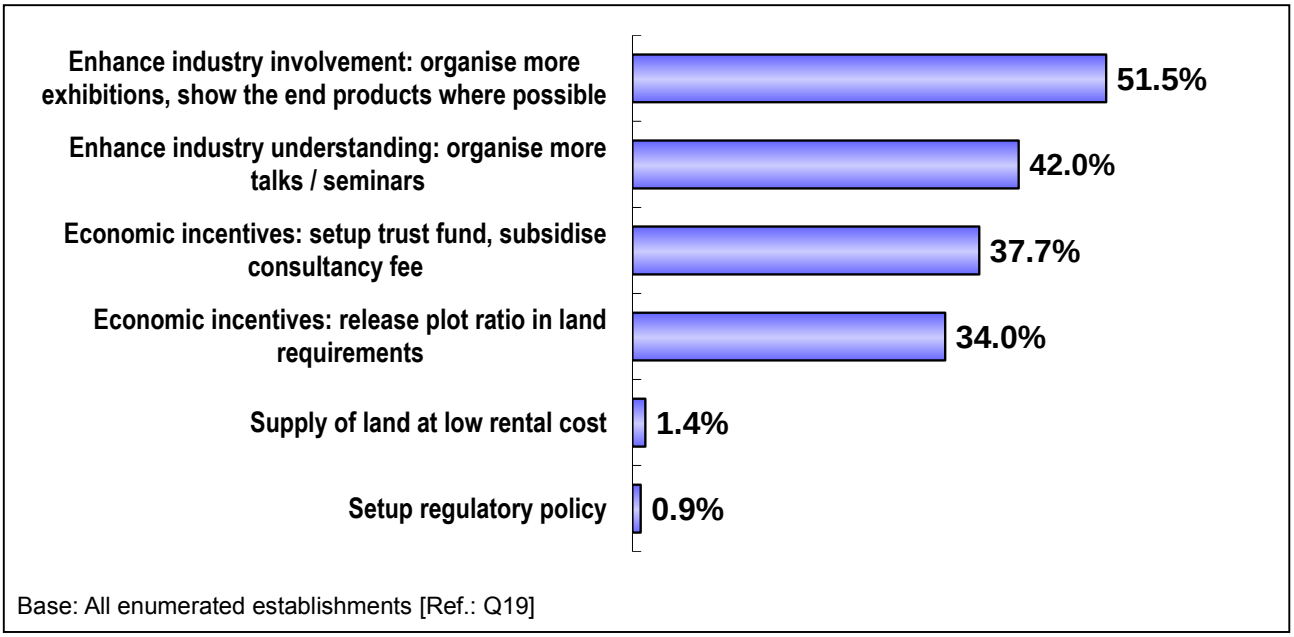
4.4 STRATEGIES FOR ENCOURAGING WIDER ADOPTION OF PREFABRICATION CONSTRUCTION METHOD

4.4.1 Ways to Encourage the Industry to Use Prefabricated Components More Widely

Of all enumerated establishments, when asked about the ways to encourage the industry to use prefabricated components more widely, relatively more suggested to enhance industry involvement by organising more exhibitions and show the end products where possible (51.5%), followed by enhancing industry understanding by organising more talks / seminars (42.0%). Comparatively speaking, fewer establishments suggested providing economic incentives by setting up trust fund for subsidising consultancy fee (37.7%) and/or by releasing plot ratio in land requirements (34.0%).

(Ref.: Chart 4.4.1)

Chart 4.4.1: Ways to encourage the industry to use prefabricated components more widely



Base: All enumerated establishments [Ref.: Q19]

Opinions from Expert Interviews

From the expert interviews, the industry professionals said they used to obtain update information about prefabrication via seminars, newsletters and information on websites from their respective professional bodies (e.g. HKIA, HKIE, HKIS, etc.). Therefore, they thought that organising more exhibitions / talks / seminars may not be very effective in encouraging wider adoption of prefabrication.

In fact, some of the respondents expected that more and more prefabricated components will be used in the coming 10 years, yet some thought that the industry has adopted prefabrication construction method to a large extent already, thus they anticipated that the

level of adoption will not largely increase in the near future.

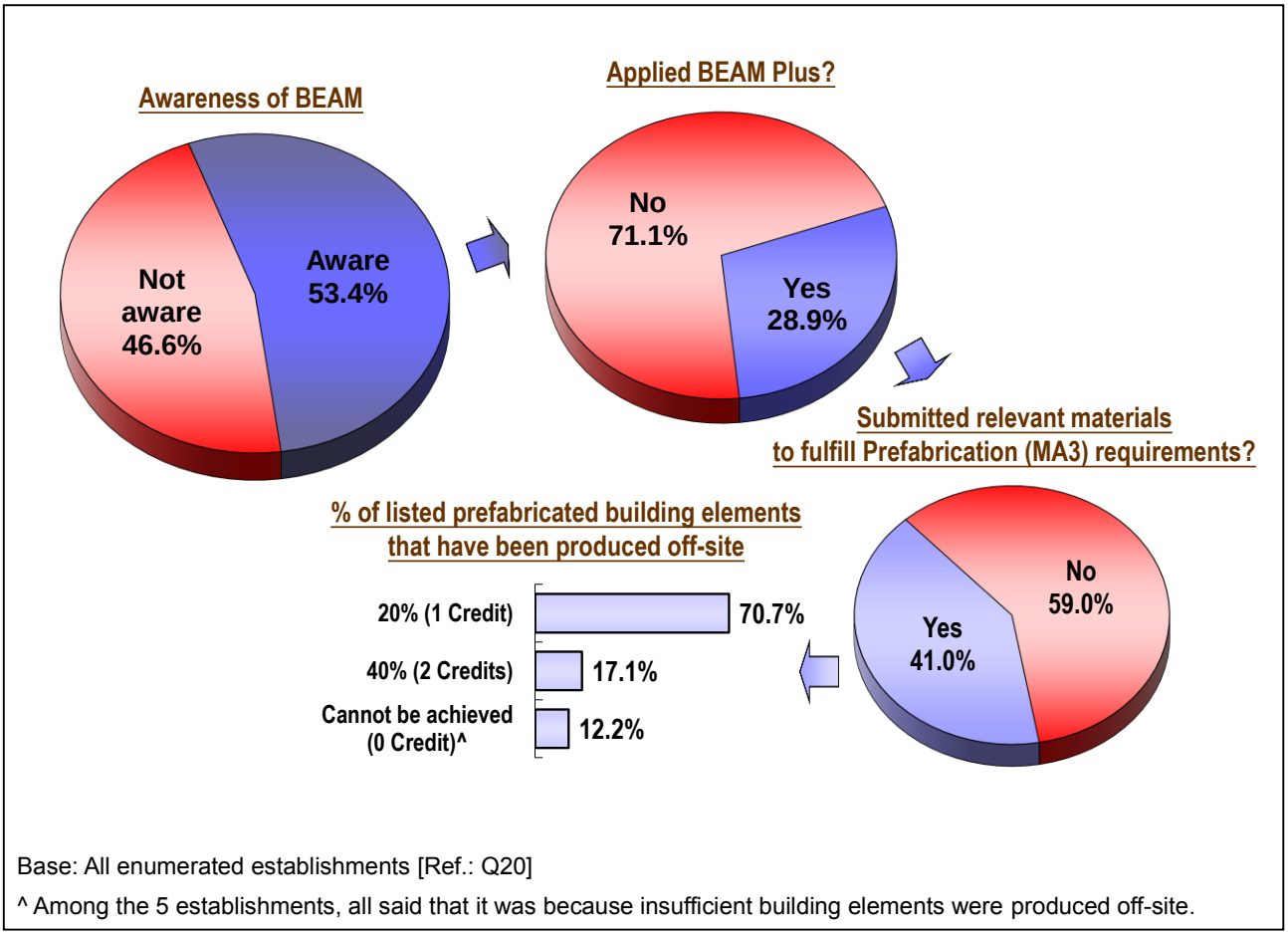
4.4.2 Usage of Prefabricated Components in Relation to BEAM

Participation of BEAM Plus and Credits Achieved in Prefabrication Requirements

Of all enumerated establishments, more than half (53.4%) said they have ever heard of the Building Environmental Assessment Method (BEAM). Among them, nearly three-tenths (28.9%) have ever submitted supporting material for BEAM Plus submission (i.e. 15.4% among all establishments), in which 41.0% have ever been requested to submit relevant materials to fulfill the BEAM Plus Prefabrication (MA3) requirements (i.e. 6.3% among all establishments). Among those which have submitted relevant materials to fulfill prefabrication requirements, most of them (70.7%) said at least 20% of the target listed prefabricated building elements have been produced off-site (1 credit).

(Ref.: Chart 4.4.2a)

Chart 4.4.2a: Participation of BEAM Plus and credits achieved in prefabrication requirements



Base: All enumerated establishments [Ref.: Q20]

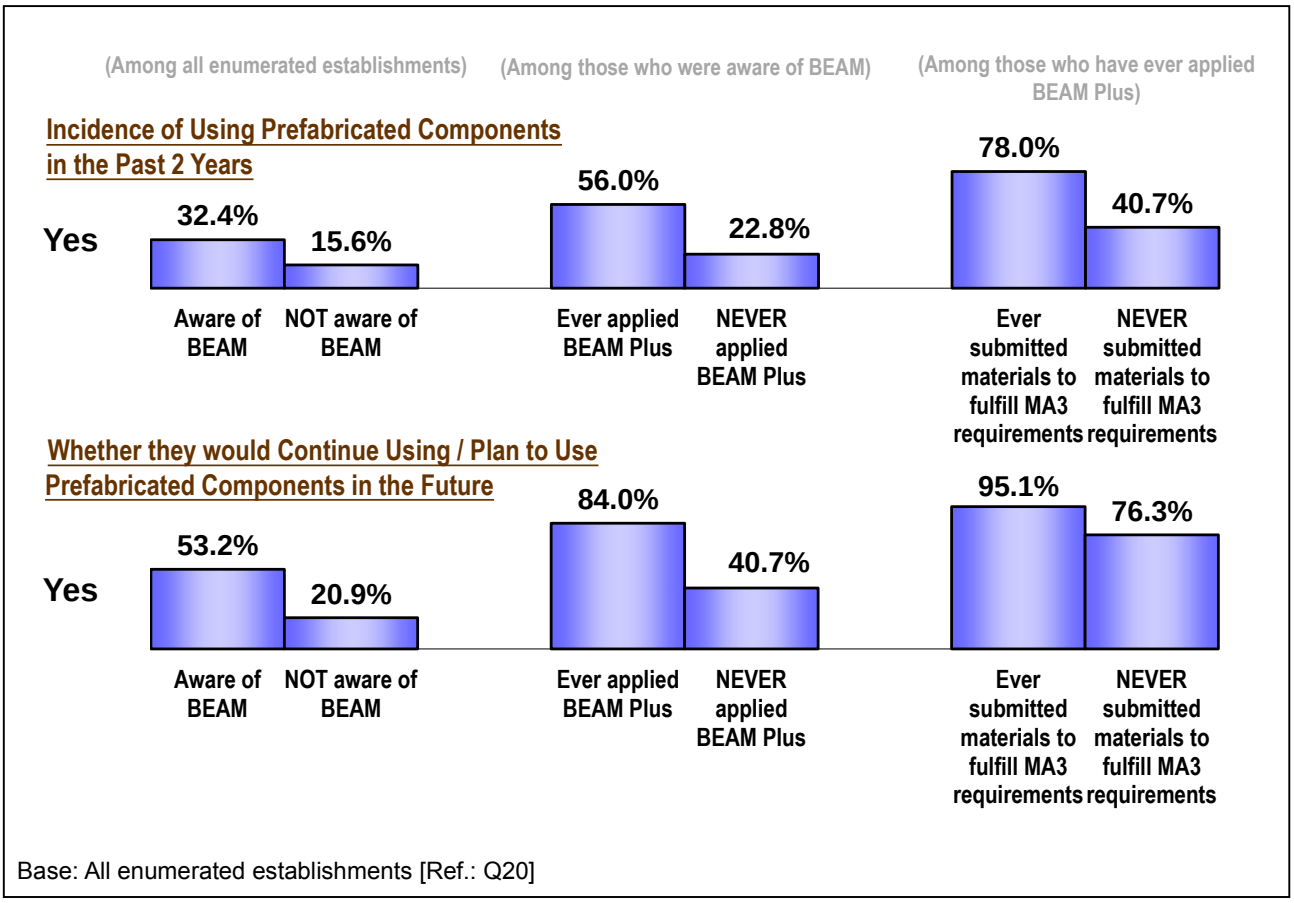
^ Among the 5 establishments, all said that it was because insufficient building elements were produced off-site.

Usage of Prefabricated Components in Relation to BEAM

Further analysis showed that establishments tended to use prefabricated components (used in the past 2 years and would use in the future) more among those which were aware of BEAM, those which have ever applied BEAM Plus and those which have ever submitted materials to fulfill BEAM Plus Prefabrication requirements. Such results illustrated that the usage of prefabricated components is highly correlated to the awareness of BEAM, whether they have ever applied BEAM Plus and whether they have ever submitted materials to fulfill its prefabrication requirements.

(Ref.: Chart 4.4.2b)

Chart 4.4.2b: Usage of prefabricated components in relation to BEAM



Base: All enumerated establishments [Ref.: Q20]

4.4.3 Other Comments Regarding the Usage of Precast Components

Finally, some respondents provided other comments that they felt important in relation to the usage of precast components. The comments were scattered and only mentioned by few respondents respectively, such as:

About the feasibility of developing local prefabrication yards

- Government should provide supportive measures for reducing the operating cost (e.g. supply of land at low rental cost, subsidies for labour cost, etc.), such that the price of local production can be more competitive. Price level is the key drive of using locally produced prefabricated components. (16 mentions);
- Welcomed the development of local prefabrication yards for providing more choices of suppliers in producing prefabricated components (8 mentions);
- Quality assurance of the prefabrication yards in Mainland China varied between different suppliers. If local prefabrication yards can perform better in this aspect and provide repair and maintenance services after sales, this will be the one of the strengths of local prefabrication yards (6 mentions);
- Hong Kong is facing the problem in shortage of land supply, which is one of the key barrier in developing local prefabrication yards (4 mentions);
- There are insufficient talents and relevant professionals in Hong Kong for developing local prefabrication yards (3 mentions).

About promoting wider adoption of prefabrication construction method

- Government or relevant parties should organise more exhibitions / talks / seminars for enhancing industry understanding and involvement (8 mentions);
- Releasing plot ratio in land requirements is the most effective way to encourage the industry to use precast components more widely (6 mentions);
- Architects and other engineers should work together much earlier and closer in the process of construction (2 mentions);
- Disagree in using prefabricated components too extensively, because this may affect the diversity of design (1 mention);
- Government should have thorough consideration about the impact to employment of local labour force (1 mention).

5 CONCLUSION & RECOMMENDATIONS

Prefabricated components tended to be used in public projects more extensively and frequently, as the design and building form in public projects are more standard.

The top category of prefabricated components which were used was concrete works. The usage of prefabricated components for steel works, pipework, ductwork and other types of work are less common, because they needed early planning and coordination, which required more time and less flexible than traditional cast-insitu building method.

The major source of prefabricated components was Mainland China, for which the prices were much lower than those in other countries / region. Yet, the drawbacks of using suppliers in Mainland China include: inconvenient for monitoring, sometimes dissatisfactory quality and sometimes having problems in clearing the customs.

Establishments which would use prefabricated components in the future generally supported Hong Kong in developing local prefabrication yards, as most of them considered that it is helpful to the development of construction industry, and only few of them claimed that they will not consider using locally produced prefabricated components.

As price is the key barrier for establishments to consider using local production, and industry professionals in the expert interviews also mentioned that the main weakness of Hong Kong is the high labour cost and land rental cost, the Government is recommended to consider providing supportive measures for reducing the operating cost of local prefabrication yards (e.g. supply of land at low rental cost, subsidies for labour cost, etc.), such that the price of local production can be more competitive.

In addition, as mentioned by some respondents, quality assurance of the prefabrication yards in Mainland China varied between different suppliers. Quality control is also one of the major factors of consideration in using produced prefabricated components. Therefore, if local prefabrication yards can perform better in this aspect and provide repair and maintenance services after sales, this will be the one of the strengths of Hong Kong.

Furthermore, respondents also recognised other advantages of local yards, including lower transportation cost, confident with the testing and certification results in Hong Kong, and more flexible in making changes due to better and closer communication with local suppliers.

Further studies in the following key areas are recommended:

- Quantifying the potential demand such that it is justify for the input of resources in developing local prefabrication yards;
- Exploring the essential factors for developing local prefabrication yards, including land supply, technological requirements, relevant talents for operating the prefabrication plants in Hong Kong, etc.;
- Investigating the impact on the existing local labour market.

Finally, for promoting wider adoption of prefabrication, the Government or relevant parties are suggested to organise more exhibitions, talks and seminars, on the one hand to enhance industry knowledge, and on the other hand to give more opportunities for potential investors of local prefabrication yards in promoting their products and services.

6 RESPONDENT PROFILE

Respondent profile

	Employers (%)	Consulting companies (%)	Contractors (%)
Type of establishment			
Private developer	71.4	-	-
Government department	23.8	-	-
Public utility	4.8	-	-
Architectural services	-	59.5	-
Building surveying	-	10.7	-
Quantity surveying	-	9.1	-
Land surveying	-	9.1	-
Civil and structural engineering	-	8.3	-
Building services engineering	-	1.7	-
Others	-	1.7	-
General contractor	-	-	71.3
Specialist contractor	-	-	15.6
Main contractor	-	-	13.0
Size of establishment			
1 – 49	23.8	77.7	92.3
50 – 99	4.8	7.4	2.2
100 – 299	-	7.4	2.2
300 or above	71.4	6.6	2.6
Unknown	-	0.8	0.8
Type of projects that the establishment has been involved in the past 2 years			
Buildings	95.2	90.1	17.0
Interior fitting out	14.3	3.3	53.8
Air-conditioning installation	19.0	18.2	26.3
Plumbing installation	19.0	17.4	17.0
Fire services works	19.0	19.8	5.3
Roads and drainage	9.5	13.2	5.3
Waterworks	-	8.3	13.2
Port works	4.8	1.7	0.6
Electrical works	-	-	6.5
Windows works	-	-	3.2
Others		7.4	4.0
Unknown	-	-	0.4
Public or private projects that the establishment has been involved in the past 2 years			
Public projects only	19.0	3.3	1.6
Private projects only	71.4	49.6	76.5
Both public and private projects	9.5	47.1	21.5
Unknown	-	-	0.4
Base: All enumerated establishments	21*	121	506

* Caution: small base (n < 30).

Respondent profile (cont')

	Employers (%)	Consulting companies (%)	Contractors (%)
No. of years of experience in the construction industry			
Less than 3 years	-	3.3	1.2
3 – 5 years	9.5	0.8	2.0
6 – 10 years	4.8	8.3	4.5
More than 10 years	85.7	86.8	91.9
Unknown	-	0.8	0.4
Main role of work			
Establishment decision maker	28.6	36.4	61.5
Construction project management	47.6	7.4	24.1
Architectural design	4.8	28.9	1.4
Construction cost control / estimation	4.8	0.8	2.4
Civil engineering design / management	9.5	1.7	0.4
Electrical and mechanical engineering design / management	-	0.8	5.5
Surveyor	-	9.1	-
Quantity surveying	-	7.4	0.2
Structural engineering design / management	-	1.7	0.6
Others	4.8	5.8	3.6
Unknown	-	-	0.4
Base: All enumerated establishments	21*	121	506

* Caution: small base (n < 30).

APPENDIX – QUESTIONNAIRE

CONSTRUCTION INDUSTRY COUNCIL 建造業議會

Construction Industry Council

Survey on Potential Utilisation of Prefabrication Yards in Hong Kong

Objective of the survey:

This survey aims to collect the opinions from industry stakeholders of the construction industry towards the application of precast components, and to assess the feasibility of establishing local prefabrication yards in Hong Kong so as to review and formulate future strategies within this context.

Based on your professional experience in the construction industry please provide us with your personal opinion where possible. All collected data will be kept strictly confidential and will be used for internal analysis purposes.

Means to return the completed questionnaire:

Construction Industry Council (CIC) has commissioned Mercado Solutions Associates Ltd. (MSA) to conduct the survey. Please return your completed questionnaire **on or before 22 August 2016** to MSA via any one of the following means:

- via mail using the enclosed self-addressed envelope;
- fax to 3167 1193;
- scan the completed questionnaire into an electronic file and email to ms@mercadosolutions.com; or
- visit the website (http://www.research.net/r/cicprefabricationyards) and complete the online questionnaire.

Thank you for your participation in this survey. If you have any enquiries about the questionnaire, please do not hesitate to contact MSA using their survey hotline telephone number 2598 5959 for assistance.

【For the following questions, please place a "✓" in the appropriate answer box ☐】

Background Information

Q1. Please indicate which type of establishment you are currently involved with either as an employer or employee:

Public/Public utilities/Developer	Consultant	Contractor
☐1 Government department	☐5 Architectural	☐11 Main contractor
☐2 Public / statutory body	☐6 Civil and Structural Engineering	☐12 General contractor
☐3 Public utilities	☐7 Quantity Surveying	☐13 Specialist contractor
☐4 Private developer	☐8 Building Surveying	
	☐9 Building Services Engineering	

☐96 Others, please specify: _____

Q2. Size of your establishment:

☐1 1 – 9 ☐2 10 – 49 ☐3 50 – 99 ☐4 100 – 299 ☐5 300 or above

Q3. Type(s) of projects your establishment has been involved with in the past 2 years (Can provide more than one answer to the question):

☐1 Buildings ☐4 Waterworks ☐7 Fire services works
☐2 Port works ☐5 Air-conditioning installation
☐3 Roads and drainage ☐6 Plumbing installation
☐96 Others, please specify: _____

Q4. Public or private project(s) your establishment has been involved with in the past 2 years:

☐1 Public ☐2 Private ☐3 Both Public and Private

Q5. Your total number of years of experience in the construction industry

☐1 < 1 year ☐2 1 – 2 years ☐3 3 – 5 years ☐4 6 – 10 years ☐5 more than 10 years

Q6. Your main role of work within the construction industry:

☐1 Establishment decision maker
☐2 Architectural design
☐3 Construction project management
☐4 Construction cost control / estimation
☐5 Surveyor
☐6 Quantity surveying
☐7 Structural engineering design / management
☐8 Civil engineering design / management
☐9 Electrical & Mechanical engineering design / management

☐96 Others, please specify: _____

Main Questions

Q7. Have you / your establishment used any prefabrication components in construction projects in the past 2 years?

☐1 Yes → Continue to Q8 ☐2 No → Skip to Q13

	Concrete Works	Steel Works	Pipework[Note]	Ductwork	Others, please specify:
Q8. What categories of prefabrication components have you / your establishment used in the past? (Can provide more than one answer to the question)	☐1 ↓	☐2 ↓	☐3 ↓	☐4 ↓	_____ ↓
Q9. Country of origin of prefabrication components. (Can provide more than one answer to the question)					
Hong Kong	☐1	☐1	☐1	☐1	☐1
Mainland China	☐2	☐2	☐2	☐2	☐2
Southeast Asia	☐3	☐3	☐3	☐3	☐3
Others, please specify:	_____	_____	_____	_____	_____

Note: Including fresh / flush water, drainage and fire services.

	Concrete Works	Steel Works	Pipework	Ductwork	Others
Q10. What are the benefit(s) for you / your establishment of using prefabrication components in construction projects? (Can provide more than one answer to the question)					
Simplify work process / Shorten project time	☐1	☐1	☐1	☐1	☐1
Guaranteed quality	☐2	☐2	☐2	☐2	☐2
Stability of quality	☐3	☐3	☐3	☐3	☐3
Relieve shortage of labour	☐4	☐4	☐4	☐4	☐4
Lower construction cost	☐5	☐5	☐5	☐5	☐5
Lower maintenance cost in future	☐6	☐6	☐6	☐6	☐6
Improve safety for construction workers	☐7	☐7	☐7	☐7	☐7
Enhance environmental protection (e.g. reduce wastage of materials)	☐8	☐8	☐8	☐8	☐8
To free up space for other on-site activities	☐9	☐9	☐9	☐9	☐9
Others, please specify:	_____	_____	_____	_____	_____
Q11. Cost effectiveness of using prefabrication components: (i.e. financial investment vs. the desired outcome)					
Very effective	☐4	☐4	☐4	☐4	☐4
Quite effective	☐3	☐3	☐3	☐3	☐3
Not quite effective	☐2	☐2	☐2	☐2	☐2
Not effective	☐1	☐1	☐1	☐1	☐1
No comment / hard to say	☐8	☐8	☐8	☐8	☐8

Q12. Please indicate the top 3 prefabrication components that you / your establishment have used in the past 2 years?

Prefabrication Component				
Concrete Works	Steel Works	Pipework	Ductwork	Others
1.	1.	1.	1.	1.
2.	2.	2.	2.	2.
3.	3.	3.	3.	3.

	Concrete Works	Steel Works	Pipework	Ductwork	Others, please specify:
Q13. Will you / your establishment continue using / plan to use prefabrication component(s) in the future? [If yes] Under which category(ies)? (Can provide more than one answer to the question)	☐1	☐2	☐3	☐4	_____
☐99 Will not consider to use any prefabrication components →Skip to Q18	↓	↓	↓	↓	↓

Feasibility of developing local prefabrication yards

Example in Singapore:
In order to enhance productivity and automation for the construction industry, Singapore developed the first pre-cast hub in 2013 for production of different prefabrication components. The hub occupies a total site area of 20,000 square meters in a 5-storey factory producing 25 different types of components.

Example in Hong Kong:
Hong Kong's first highly automated reinforcement steel processing plant for cutting and bending steel reinforcing bars began its operation in January 2016. The plant is located in Tsing Yi with a total site area of 30,000 square meters. It can perform cutting and bending as well as quality control.

	Concrete Works	Steel Works	Pipework	Ductwork	Others:
Q14. If Hong Kong were to develop related prefabrication yards, do you consider that it would be helpful to the development of the local construction industry? (For example, guarantee of quality, lower transportation costs, etc.)					
Very helpful	☐4	☐4	☐4	☐4	☐4
Quite helpful	☐3	☐3	☐3	☐3	☐3
Not quite helpful	☐2	☐2	☐2	☐2	☐2
Not helpful	☐1	☐1	☐1	☐1	☐1
No comment / hard to say	☐8	☐8	☐8	☐8	☐8
Q15. If Hong Kong were to develop prefabrication yards for production of different components, what are the factors you would consider in using the local production of prefabrication components?	[Rank from 1 – 3]	[Rank from 1 – 3]	[Rank from 1 – 3]	[Rank from 1 – 3]	[Rank from 1 – 3]
QC is done locally	☐	☐	☐	☐	☐
Quality is better than overseas production	☐	☐	☐	☐	☐
Quality is more stable than overseas production	☐	☐	☐	☐	☐
Production time is shorter than overseas	☐	☐	☐	☐	☐
Reduced wastage of components during transportation	☐	☐	☐	☐	☐
Lower the transportation cost of the prefabrication components	☐	☐	☐	☐	☐
Better communication with local vendor (e.g. product design, time of delivery, etc.)	☐	☐	☐	☐	☐
Others, please specify:	_____ ☐	_____ ☐	_____ ☐	_____ ☐	_____ ☐
	☐9 Will not consider	☐9 Will not consider	☐9 Will not consider	☐9 Will not consider	
	If you have ranked any factors in Q15 → Continue to Q16 **If you have answered "will not consider" on all items in Q15 → Skip to Q17**				

[If you WOULD CONSIDER using LOCAL PRODUCTION of Prefabrication Components]

Q16. Please give 3 locally produced prefabrication components that you would consider using

Prefabrication Component				
Concrete Works	Steel Works	Pipework	Ductwork	Others
1.	1.	1.	1.	1.
2.	2.	2.	2.	2.
3.	3.	3.	3.	3.

If you have answered "will not consider" on any item in Q15 → Continue to Q17; Otherwise Skip to Q19

	[If you WOULD NOT CONSIDER using LOCAL PRODUCTION of Prefabrication Components]				
	Concrete Works	Steel Works	Pipework	Ductwork	Others:
Q17. Your reasons for not considering the usage of any local production of precast components are? (Can provide more than one answer to the question)					
Worried that the time for local QC inspection is longer	☐1	☐1	☐1	☐1	☐1
Worried that the quality may not be good enough	☐2	☐2	☐2	☐2	☐2
Worried that the quality is unstable	☐3	☐3	☐3	☐3	☐3
Worried that the time for local production is longer	☐4	☐4	☐4	☐4	☐4
Worried that the price is higher	☐5	☐5	☐5	☐5	☐5
Others, please specify:	_____	_____	_____	_____	_____
	Skip to Q19				

Q18. **[If you WOULD NOT CONSIDER using ANY prefabrication components]**

Your reasons for not considering the usage of any prefabrication components are? (Can provide more than one answer to the question)

☐ 1 Cannot shorten the project time
☐ 2 Cannot guarantee good quality
☐ 3 Cannot guarantee stability of quality
☐ 4 Cannot relieve the problem of labour shortage
☐ 5 Cannot lower the construction cost
☐ 6 Concerned about the space for storage at the construction sites
☐ 7 Need more time for project design / planning / getting approval from authorities
☐ 8 Difficult to make changes on the design during the construction process

Others, please specify: _____

[All Respondents]

Q19. What are the means to encourage the industry to use precast components more widely? (Can provide more than one answer to the question)

☐ 1 Enhance industry understanding: organise more talks / seminars
☐ 2 Enhance industry involvement: organise more exhibitions, show the end products where possible
☐ 3 Economic incentives: setup trust fund, subsidize consultancy fee
☐ 4 Economic incentives: release plot ratio in land requirements

Others, please specify: _____

Q20. (a) Have you ever heard of the Building Environmental Assessment Method (BEAM) (i.e. a standard that defines green building quality)?

☐1 Yes → Continue to (b) ☐2 No → Skip to Q21

(b) Have you ever submitted any supporting material for BEAM Plus submission?

☐1 Yes → Continue to (c) ☐2 No → Skip to Q21

(c) Have you been requested to submit relevant materials to fulfill the BEAM Plus Prefabrication (MA3) requirements?

☐1 Yes → Continue to (d) ☐2 No → Skip to Q21

(d) What is the target listed prefabricated building elements* that have been produced off-site?

(*The listed building elements (pre-cast concrete) includes: facades, staircases, slabs, balcony / utility platform, parapet, partition walls, bridge-decks and footbridges)

☐1 20% (1 Credit)
☐2 40% (2 Credits)
☐3 Cannot be achieved (0 Credit)
(Reason, please specify: _____
_____)

Q21. Please provide us with other comments (if any) regarding the usage of precast components.

_____

_____

Contact Information

Please kindly provide the contact information of the person who completed this questionnaire.

Name of establishment: _____

Contact person: _____ Title of contact person: _____

Contact tel. no.: _____ Contact email address: _____

End of the questionnaire

Thank you for your valuable time and comments