

AsiaConstruct22

Theme Paper –

Human Resource Development in Construction,
Hong Kong

prepared by

AsiaConstruct Hong Kong Team

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*About the Research Centre for Construction and Real Estate Economics
(RCCREE):*

The RCCREE is the Hong Kong Polytechnic University's Research Centre for solution oriented research and consultancy in construction and real estate economics. It undertakes internationally relevant multi-disciplinary research that supports the advancement of the construction and real estate industries in the following areas: Economic Policy and Institutional Analysis, Real Estate Economics, Construction Economics, Housing, Human Behavior in Economic Decision Making, and Value Management and Facilities Performance. For further information, please contact Professor Eddie C.M. Hui (bscmhui@polyu.edu.hk).

1. Executive Summary

Human resource development (HRD) remains one of the key forces propelling construction industry development. This study examines HRD in the construction industry of Hong Kong from various aspects, such as manpower development, training and education, and forecast human resource.

The construction industry plays an instrumental role in shaping the employment structure. The number of vacancies in the construction sites of Hong Kong increases rapidly, reflecting the strong growth of the industry (BEC, 2013). With a population of approximately 7 million, the number of employed persons in the construction sector was 337,200, and the unemployment and underemployment rates were 4.4% and 5.1%, respectively, in the first quarter of 2017. Wages and earnings sustained a moderate increase in 2016 (Census and Statistics Department, 2017a). However, Hong Kong's construction industry has encountered serious challenges, such as lackluster international markets, labor shortage, and skyrocketing production and labor costs. In the absence of manpower planning and development, the size of the labor pool fluctuates, causing shortages and surpluses. An aging workforce, job mismatches, training limitations, and increasing manpower demands are the possible factors that will result in a critical manpower situation in the coming years.

HRD provides a strategic significance to the quality of labor force. The planning of construction skill training may resolve the demand and supply imbalance. Meanwhile, all construction stakeholders should work together closely to facilitate manpower development. A successful policy should consider that education, training, and lifelong learning policies must respond to the demands. Well-planned, properly taught, implemented skills and knowledge-based trainings can enable the construction industry to use the best possible strategy to tackle these deep-seated problems in Hong Kong. Reinforcing new skills is crucial in sustaining the construction industry in the future. One approach to facilitate manpower planning would be to predict the occupational trends in labor resources. Manpower demand can only be effectively addressed by a thorough understanding of the structure and trends of the construction workforce and future skill requirements of the industry (Agapiou, Price, & McCaffer, 1995). The mismatches between labor demand and supply in the market may cause serious effects on the development of the industry and its ability to sustain the skilled workforce. Reliable estimates of manpower demand are required.

The aging workforce in Hong Kong aggravates the labor supply shortage in the construction industry, thereby exacerbating the problem. Nearly 40% of construction site workers in the country are in their 50s, and their productivity is declining. Furthermore, over 30% of the current registered workers are under the age of 40. The retirement age bracket is from 61 to 70. Despite continued wage hikes in recent years, the number of young newcomers is relatively small, and the overall demand for construction workers in Hong Kong is increasing. Forecast elucidates that the construction industry took up roughly 258,000 workers in 2016 and is expected to reach around 285,000 by 2023 with an upward trend, representing an increase of approximately 10.45% in 7 years (CIC, 2014). At the technologists' level, although a total of 350 civil engineering students graduate from three local universities every year, the number of these graduates is still insufficient to cope with the construction industry's manpower shortage.

Additionally, new recruits need training and on-the-job practice before they can work independently. Evidently, enhancing the quality and quantity of local manpower from labor to technologist levels is an extremely slow solution to meet the urgent need. As a last resort, foreign labor should be imported in a targeted manner to meet the pressing need.

Given that construction is one of the main pillars of the economy in Hong Kong, the future human resource development of the construction industry should focus on manpower sustainability and employee caring. Support and guidance are recommended from the government, public organizations, private developers, construction consultations, main contractors, and construction-related associations toward sustainable construction.

2. Main Issues with the Human Resource Development in Construction in Hong Kong

2.1 Scope of human resource development in Hong Kong

2.1.1 Background

Current situation of the Hong Kong construction industry

The construction industry is a significant part of the economy in Hong Kong, which embraces all the construction activities of major infrastructures and real estate properties, including new construction, as well as repairing and alterations of any existing structures. The industry involves a wide range of stakeholders, such as private developers, the government, public organizations, main and subcontractors, skilled and general workers, construction consultants, and construction-related associations and unions. The overall gross value of construction work performed by main contractors has been growing since 2007. The public sector has become a driving force for the growth of the construction industry by over 3 times in terms of construction project investments, which increased the overall construction activity by more than 75% to a total gross value of HK\$145 billion¹ by the end of 2015, accounting for more than 5.4% of the GDP in Hong Kong (Census and Statistics Department, 2016).

The demand for construction services, particularly from the public sector, remains high. The rise in public expenditure on infrastructure has mainly been driven by the Ten Mega Infrastructure Projects and transport infrastructure projects, such as the Guangzhou–Shenzhen–Hong Kong Express Rail Link and the Hong Kong–Zhuhai–Macau Bridge. Further public expenditure on housing is also anticipated to increase, with the construction of at least 75,000 public rental housing units and 17,000 home ownership flats in the next 5 years.

Various projects should commence orderly in accordance with the manpower supply and demand situation of the construction industry to ensure the sustainable manpower supply of the construction industry and to avoid situations where workers suffer from the plight of “dying of overwork at one time and of starvation at another.” For example, the Mass Transit Railway Corporation Limited (MTRCL) submitted proposals for the Northern Link (as well as Kwu Tung Station), East Kowloon Line, Tuen Mun South Extension, the Tung Chung

¹Exchange rate, US\$ 1 ≈ HK\$ 7.8.

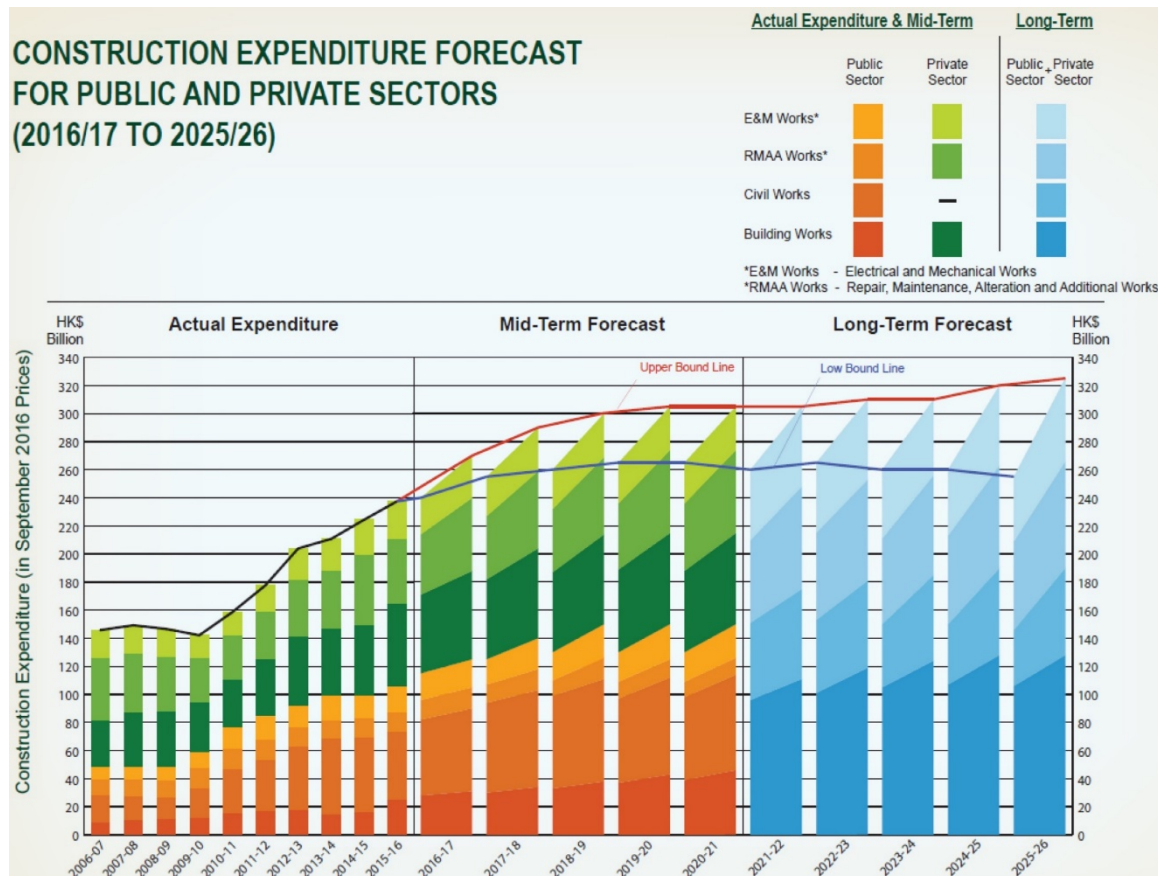
West Extension, and Tung Chung East Station at the end of 2016 and 2017. According to the forecast over a 10-year horizon planning at the end of 2016, the total output of those projects will exceed the level of HK\$300 billion, indicating a persistently high demand for construction services (Legislative Council, 2017). The government will implement new railway projects orderly in light of the manpower situation of the construction industry. The first batch of railway projects (including the Northern Link and Kwu Tung Station, Tuen Mun South Extension, and East Kowloon Line) under the Railway Development Strategy 2014 is expected to commence in 2018 and 2019 to make good use of the construction industry manpower to be released following the completion of the Hong Kong-Zhuhai-Macao-Bridge and the Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link within the next one to two years.

Table 1: Number of Employed Persons in the Construction Sector
by Broad Occupation (Unit: 1000 Persons)

		Managers and administrators	Professionals	Associate professionals	Clerical support workers	Craft and related workers	Plant and machine operators and	Elementary occupations	Overall
2015	Q1	13.8	14.2	45.1	15.8	145.5	9.2	60.0	303.7
	Q2	16.8	17.3	48.4	16.2	142.9	11.9	62.0	315.6
	Q3	17.4	14.7	53.9	17.4	147.7	11.0	59.0	321.1
	Q4	19.0	20.5	47.8	15.9	148.1	10.6	61.3	323.2
2016	Q1	18.8	19.1	49.4	19.7	142.7	9.7	60.3	319.9
	Q2	18.0	17.7	59.8	15.3	143.9	9.4	59.9	324.0
	Q3	19.4	21.0	56.8	15.8	146.3	10.4	63.3	333.0
	Q4	21.0	18.7	57.4	17.3	143.2	9.4	69.7	336.6
2017	Q1	20.8	17.8	54.2	19.3	147.4	11.6	66.1	337.2

Source: *Number of Employed Persons by Industry and Occupation*, Census and Statistics Department, 2017b, HKSAR Government, from
<http://www.censtatd.gov.hk/hkstat/sub/sp200.jsp?productCode=D5250003>.

Figure 1: Construction Expenditure Forecast for Public and Private Sectors
(2016/2017- 2025/2026)



Source: *Forecast of Manpower Situation of Skilled Construction Workers*, Construction Industry Council (CIC), 2016.

Shortage of construction manpower

The construction industry sector suffers the most because of manpower shortage. According to the Government's *Population Policy: Strategies and Initiatives*, the current vacancy rate in the construction industry was as high as 73.1% in 2014 (Chief Secretary for Administration's Office, 2015). Furthermore, the data of the Hong Kong Construction Association elucidate that the sector has suffered from a sustained shortage of more than 10,000 skilled workers. With the current virtually full employment in Hong Kong, poaching workers from other sectors to meet the manpower demand of housing development and infrastructure projects in the straitened circumstances of acute manpower shortage is undesirable. Undeniably, the government and the trade sector have taken many measures to alleviate the labor shortage by upgrading technologies to reduce labor requirements. Wages have been increased in the construction industry to retain workers and attract several young people to join the trade. However, manpower shortage remains one of the most pressing issues facing the construction industry of Hong Kong, notwithstanding a survey reporting labor shortage in the construction industry as conducted by the Hong Kong Construction Association in November 2016. The shortage rate of construction workers stood at approximately 7.5%, which was lower than the corresponding rates of 18.6% and 12.8% in the

same period of the preceding two years. While the manpower shortage problem has been slightly alleviated, the industry is still afflicted by the problem of an aging labor force. Currently, over 40% (approximately 170,000) of construction workers are 50 years old or above.

Aging population and insufficient new blood

The aging but highly educated workforce in Hong Kong aggravates the labor supply shortage in the construction industry, thereby exacerbating the problem. Despite continued wage hikes in recent years, young newcomers are relatively few. The highly-educated youth prefer white-collar posts over manual work. For expediency, the construction sector has taken a “hire first, train later” approach in recent years. However, this approach is ineffective as most of the workers are only semi-skilled. Enhancing the quality and quantity of local manpower takes considerable time to address the urgent need. As a last resort, foreign labor may be imported to meet the pressing need.

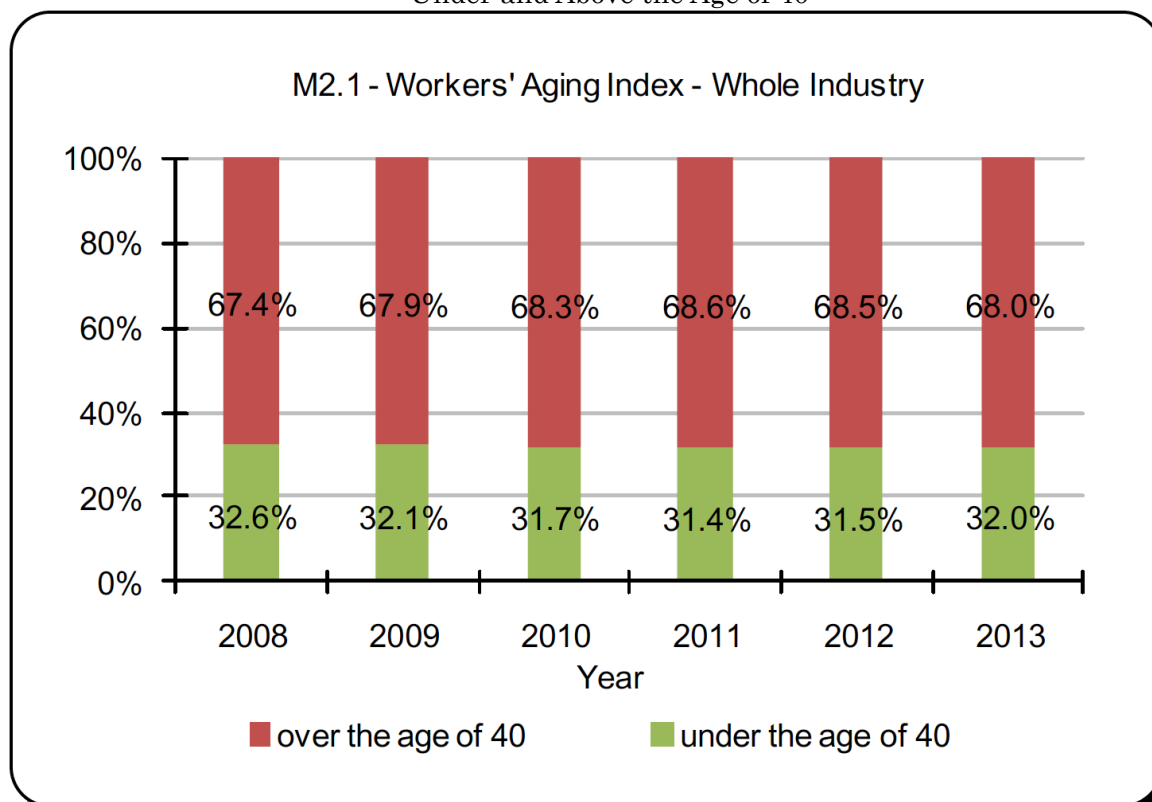
Table 2 Manpower Supply by the Age Distribution of Registered Workers of all Trades and by Skill Level (2016)

	All Trades of Manpower Supply						
Age	RGW	RSS	RSS(P)	RSW	RSW(P)	Total	%
< 20	2,475	208	0	13	0	2,696	0.60%
20 - 24	27,149	3,267	0	879	0	31,295	7.00%
25 - 29	28,623	5,121	1	3,369	0	37,114	8.30%
30 - 34	20,607	3,418	3	11,580	0	35,608	7.97%
35 - 39	20,230	2,819	0	20,761	120	43,930	9.83%
40 - 44	23,637	2,312	1	25,076	164	51,190	11.45%
45 - 49	26,195	2,002	1	28,057	205	56,460	12.63%
50 - 54	23,850	1,621	0	30,818	188	56,477	12.64%
55 - 59	22,057	1,694	2	40,203	190	64,146	14.35%
60 and over 60	26,825	1,909	2	39,105	175	68,016	15.22%
Total	221,648	24,371	10	199,861	1,042	446,932	100.00%

Source: *Age distribution of registered workers by trade by skill level (No. of applicants)*, CIC, 2017.

Note: RGW: registered general worker; RSS: registered semi-skilled worker; RSS (P): registered semi-skilled worker (provisional); RSW: registered skilled worker; RSW(P): registered skilled worker (provisional).

Figure 2: Workers' Aging Index of Registered Workers
Under and Above the Age of 40

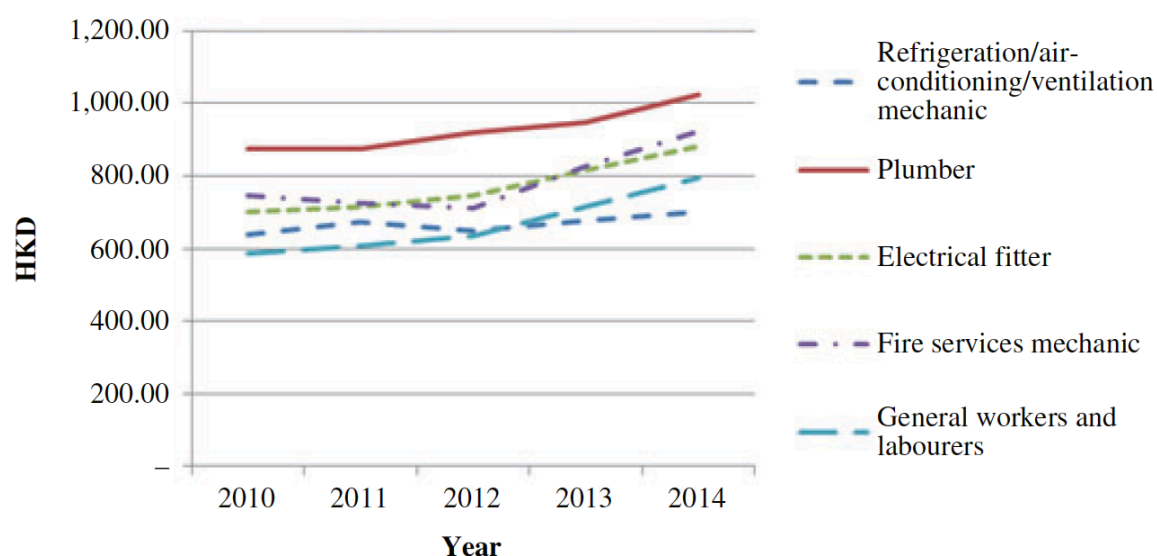


Source: Manpower KPIS, M2 Workers' Aging Index - % of Registered Workers Under and Above the Age of 40, CIC, 2016, available in http://www.cic.hk/eng/main/research_data_analytics_/industry_report/perform_report_2012/manpower_kpi/.

Workers' wages

The average monthly wages in 2016 was approximately HK\$21,200 compared with HK\$20,000 in 2015 (Census and Statistic Department, 2017), which represents an increase of approximately 3.5%. Skilled workers command high wages. For instance, the average daily wage of plumbers increased from approximately HK\$948 per day in 2013 to HK\$1,024 per day in 2014, representing an increase of approximately 8.0% within one year. The average daily wages of electrical fitters also increased by approximately 8.4% from roughly HK\$814 per day in 2013 to HK\$882 per day in 2014. The wages of fire service mechanics increased from approximately HK\$826 per day in 2013 to HK\$924 per day in 2014, whereas those of general workers and laborers increased from roughly HK\$716 per day in 2013 to HK\$793 per day in 2014. Below is the chart showing the average daily wages of such workers from January 2010 to December 2014 (Figure 3). In the first quarter of 2017, the median salary in the construction industry was HK\$17,100, which increased by 6.87% compared with that in the same quarter of 2016 (see Table 3). The median salary in the construction industry was close to the Hong Kong median salary, including all workforces in the overall construction industry. The salaries of craft and related workers/elementary occupations were lower than the Hong Kong construction industry median monthly earnings, whereas the median salary of managers and administrators/professionals/associate professionals was higher than the Hong Kong construction industry median monthly earnings.

Figure 3: Average Daily Wages of the Different Types of Workers



Source: *Average Daily Wages of Workers Engaged in Public Sector Construction Projects as Reported by Main Contractors (January 2010–December 2014)*, Census and Statistic Department, 2015.

Table 3: Real Wage in the Construction Industry of Hong Kong (2013-2017)

Year		Median monthly earnings in the construction industry (HK\$)
2015	Q1	15,000
	Q2	15,000
	Q3	15,600
	Q4	16,000
2016	Q1	16,000
	Q2	16,300
	Q3	17,000
	Q4	17,100
2017	Q1	17,100

Source: *General household survey*, Census and Statistic Department, 2017c.

Note: The inflation is accounted by the Composite Consumer Price Index (CPI) to obtain the real wage trend.

2.1.2 Needs and objectives for HRD in the construction industry

The effective management of labor force is a key to the strategic significance of HRD, which aims to assess the trends of manpower demand and supply in the Hong Kong construction industry, to identify the discrepancies between the demand and the supply of the labor market, to provide information for policy makers on the changes likely to occur in the construction investment and occupational profile of the labor force, as well as on the broad implications of these changes for training and employment policies, and to promote a series of short-term actions and long-term strategies to meet the future needs. The construction industry should maintain a skilled and competitive work force for rapid changes of construction activities. The construction industry is one of the most labor-intensive industries (Ho, 2010). Manpower plans cannot be blueprints in any rigid sense. Certain issues of construction projects related to human recourse demand and supply, such as increasing investment and the enlarging scale of projects demanding considerable manpower, will always emerge, and vice versa. Manpower planning is a dynamic progress although we have a concrete plan for those construction projects. Thus, HRD should be treated as one among many pieces of information which planners should assess before making decisions. The Hong Kong Government has been conducting long-term planning for infrastructure projects and the consideration of the actual delivery capacity of the construction industry to ensure the smooth implementation of the projects. This endeavor can also foster the steady and sustainable development of the construction industry. The construction industry should, thus, appreciate the complexity of the labor market to ensure balanced labor skills and healthy human resource development. Table 4 shows that construction activities and the number of required skilled workers are expected to increase steadily in the foreseeable future.

Table 4: Estimation of Additional Skilled Workers Required in the Coming Years

Year end	2017	2018	2019	2020	2021
2016 update	10,000-15,000	10,000-15,000	10,000-15,000	10,000-15,000	15,000

Source: *Report on Manpower Projection to 2022*, Government of HKSAR, 2015.

Note: Figures are absolute at the end of corresponding years and are non-cumulative.

Steered by the Committee on Environment and Technology, the Committee on Construction Safety, Committee on Procurement and Sub-contracting, and Committee on Productivity and Research and established under the CIC, the construction industry developed a set of Key Performance Indicators (KPIs). The manpower issue is one the five most important areas of the construction industry in Hong Kong.

Table 5: Classification of KPIs

5 Areas	4 Categories	2 Sectors
Productivity (7 KPIs)	Whole Industry	Public
Health & Safety (3 KPIs)	Civil Engineering Works	Private
Environment (3 KPIs)	New Building Works	
Manpower (3 KPIs)	RMAA Works	
Dispute Resolution (3 KPIs)		

Source: *Hong Kong Construction Industry Performance Report for 2013*, CIC, 2015.

2.2 Human resource administration in construction

As a clarification and without being exhaustive, the Registration Board of the Hong Kong Government sets out below typical examples of duties and functions that may be carried out by professional and technical personnel, as well as those persons under training, whether at or outside any construction site (CIC, 2016):

- a) Attending to construction works for preparing, checking, and coordinating designs and assessing and investigating construction sites;
- b) Attending to project management, progress coordination, monitoring, measurement, compliance, and acceptance on construction works;
- c) Supervising construction works and providing instructions, directions, pieces of advice, and illustrations to facilitate construction works, including matters related to safety and environmental requirements;
- d) Inspecting, surveying, verifying, and validating construction sites and construction works;
- e) Testing, commissioning, and accepting equipment, systems, and installations for progress monitoring, compliance, and other purposes relating to functionality, including demonstration works; and
- f) Carrying out repair and maintenance works of plant and machinery, which does not form any part of any specified structure set out in the ordinance.

2.3 Skill development

2.3.1 Mismatch of skills in the construction industry

Most construction works require specialized trade skills. Skill mismatch among construction workers is significant. The Construction Industries Employees' General Union recognized that a wrong division of workers in different fields occurs, which results in unclear recognition of different skill level workers because most workers are registered as "general workers" only without future specification. In fact, 60% of construction workers are registered as "general workers" under the construction workers registration scheme, whereas "skilled/semi-skilled workers" contribute to less than 40% of the total number of registered construction workers. Probably due to the insecurity of employment, most construction workers are reluctant to attend training courses to develop capabilities and enhance their skill sets. They have limited resources and time to participate in employees' training; hence, their competency base remains fairly weak (BEC, 2013).

To cope with the persistent manpower demand of the construction industry, the Hong Kong Government has collaborated with the CIC to conduct assessments on the supply and demand of professionals and workers, to develop progression pathways, to attract entrants to join the industry, and to strengthen training for construction workers to upgrade their skills to semi-skilled and skilled levels. From 2009 to 2016, the CIC has trained more than 24,000 semi-skilled workers (CIC, 2017). Approximately 60% were under 35 years old and well below 46, which is, currently, the average age of the registered workers. This scenario shows that certain young people are still interested in joining the construction industry. During the period of 2009 to the present, the total number of registered workers has risen from 270,000 to 430,000, whereas that of registered skilled/semi-skilled workers has also risen from about 107,000 to 214,000 (CIC, 2017).

2.3.2 Training and education policies on construction personnel

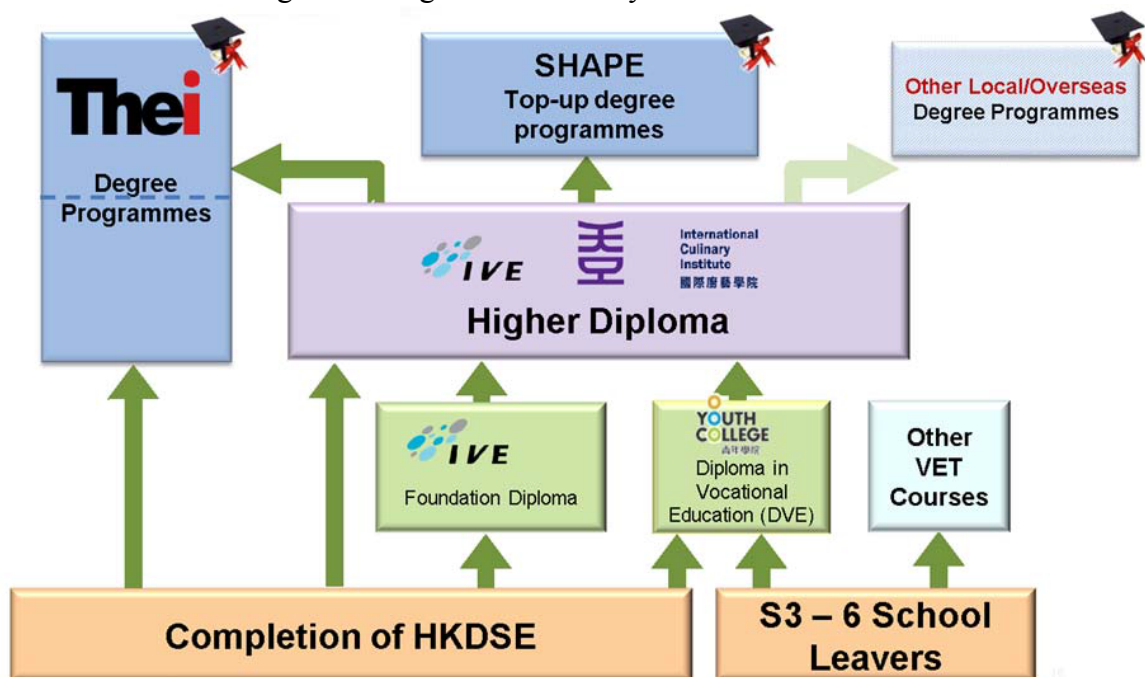
Education and training practices are required in the multi-skill development of construction workers. Particularly, the number of skilled/semi-skilled workers is insufficient because (i) young people might view construction work negatively; (ii) the construction worker registration scheme is at the primary stage; and (iii) only few public organizations require workers to have trade test qualifications for employment. Workers also lack incentives to undertake formal training programs due to the practice of subcontracting and financial obligations (Wong et al., 2006). This situation causes difficulties in promoting skill development and impedes manpower planning and professional development. The supply of skills and knowledge to the construction industry is primarily governed by existing stock and supply of manpower, along with the upgrading of the workers' skills (Chan et al., 2006). Therefore, the quality of labor will depend on the training, abilities, and motivation of the individuals involved.

Skill grading has long been a major challenge for the construction industry. Training institutions and governments must be aware of the transformation and its impact on the number and skills of graduates required by the industry. This awareness is important as the employability and the effectiveness of the construction industry depend on the quality of the workforce that it educates and

trains. Hence, a strong commitment is required from construction firms, training institutions, and governments to maintain training levels. The Vocational Training Council (VTC) and various universities currently provide the main labor supply for the construction sector in Hong Kong. Each of these parties makes a significant contribution toward preparing new graduates and developing the skills of the manpower in the industry.

The establishment of the Junior Technical School on Caroline Hill in 1932 began a vocational education with a history of more than 80 years in Hong Kong. However, it was not until the founding of the VTC in 1982 that Hong Kong had a statutory organization dedicated to the development of vocational education and training (VET). Table 6 provides the details of the VTC training program related to the construction industry until 2016–2017. In 2013–2014, a total of 46,500 students enrolled in full-time vocational education programs offered by VTC, accounting for roughly one-tenth of the full-time students at the upper secondary to tertiary levels in Hong Kong. Moreover, VTC also offered 190–200 on-the-job training places for working adults during the year (Legislative Council Secretariat, 2015). Pursuant to an initiative in the 2014 Policy Address, the government established the Task Force on Promotion of Vocational Education ("Task Force") in June 2014, aiming to guide "the younger generation in choosing their career." On 6 July 2015, the Task Force completed the study and submitted a report to the government, which examined the feasibility of the strategies and recommendations therein for subsequent policy formulation and implementation.

Figure 4: Progression Pathways of VTC Graduates



Source: *Progression ladder*, VTC, 2015.

Table 6: Hong Kong Council for Accreditation of Academic
and Vocational Qualifications Approved Program Areas
Related to the Construction Industry

Area of Study and Training	Sub-area	Programme Area (in bold) and Scope of Programme Area	QF Level
Architecture and Town Planning	Architecture, Construction and Town Planning	Construction <ul style="list-style-type: none"> Study and training in the arts and / or science and technology for designing, constructing and maintaining of buildings, infrastructures, etc., formulating solutions and understanding of such work. 	4
	Construction Management	Construction Management <ul style="list-style-type: none"> Study and training in construction projects covering houses, bridges, roads, etc. 	4
Engineering and Technology	Electrical, Electronic and Mechanical Engineering and Services	Engineering and Technology (Covering the whole Area of Study and Training and all Sub-areas) <ul style="list-style-type: none"> Study and training in the application of mathematics, science, practical knowledge, techniques, skills and engineering principles to innovate, design, build, maintain and improve structures, machines, tools, systems, components, materials, and processes. It covers a comprehensive spectrum of engineering disciplines and technologies including aircraft maintenance engineering, automotive engineering, bioengineering and biotechnology, civil engineering, electrical and electronic engineering, manufacturing technology, marine engineering, maritime studies, mechanical engineering, precision trades and textile and clothing technology, and other engineering, related technology and services. 	4
	Manufacturing Technology		
	Civil Engineering		
	Bioengineering and Biotechnology		
	Other Engineering, Related Technology and Services		
	Textile and Clothing Technology		
	Automotive		
	Precision Trades		
	Other Technical Studies and Training		

Source: *The Hong Kong Qualifications Framework (HKQF)*, Hong Kong Institute of Vocational Education, Vocational Training Council, 2017. Detailed definition at <https://www.hkqf.gov.hk/en/home/index.html>.

Note: Knowledge and Understanding, Generic Cognitive Skills Level 4 (HKQF):

- Basic knowledge
- Certain simple facts and ideas in, about, and associated with, a subject/discipline/sector
- Knowledge of basic processes, materials, and terminology
- Use, with guidance, given stages of a process to deal with a problem, situation, or issue
- Operate in straightforward contexts
- Identify and/or take account of certain consequences of action/inaction
- QF 4 refers to Business and Technology Education Council Introductory Diploma/Certificate.

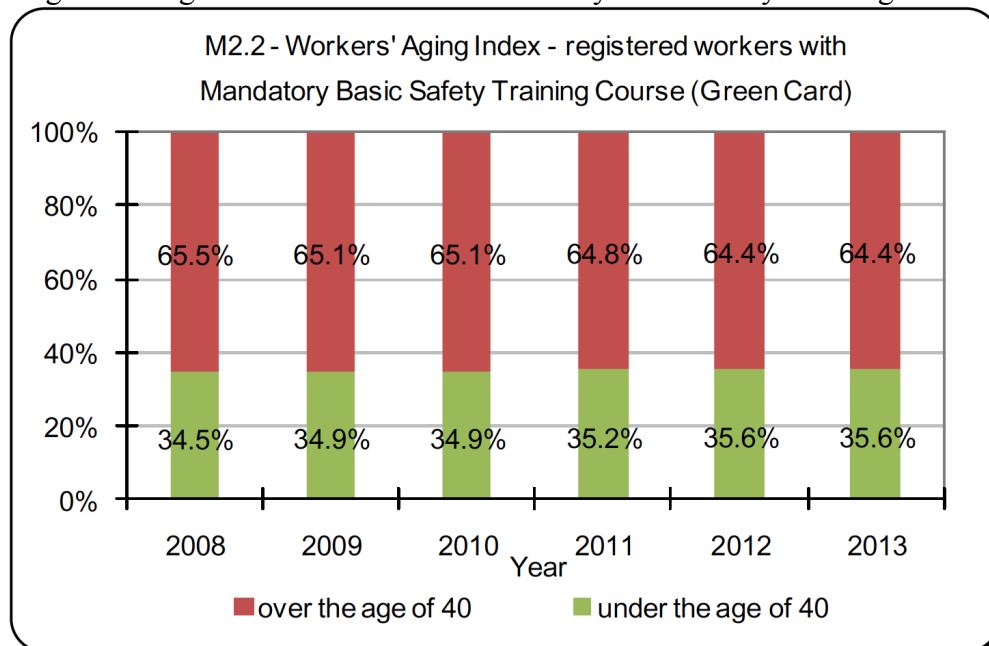
Ensuring that the skilled workforce undergoes training and that practicing professionals recognize and accept the new challenges is critical in supporting the envisioned transformation of the construction industry. Furthermore, workers should be provided with opportunities to develop the required core competencies.

It is crucial for anyone involved in the construction industry, particularly training organizations and policy makers, in their mission to maintain a skilled, competitive, and adequate workforce able to meet the future demands of the industry.

A government-funded scheme for employment training is essential to upgrade the skills of workers. Trainees generally emerge with underdeveloped techniques from attending short training courses. To develop highly skilled workers, experienced workers should contribute to the training and development scheme as mentors in the training initiatives. For example, additional on-the-job training for entrants has been recommended to allow them to brush up on their skills. Additional funding is also advised for the sponsorship of construction workers, enabling them to join training programs. Skilled workers will be retrained to be multi-skilled to allow the skill transfer process to facilitate added employment opportunities for them. Additional training courses should also be organized through trade associations.

Figure 5 reveals that, over the last six years, only roughly 35% of the registered workers with mandatory basic safety training course (green card) are under the age of 40. Just over 30% of the currently registered workers are under the age of 40. The number of registered workers in this age group has been decreasing steadily over the last six years although the number of registered workers with mandatory basic safety training course (green card) in the same age group has remained largely unchanged. An improvement trend was observed between 2007 and 2012 in the retention rate of graduates for the basic craft courses and the Construction Supervisor/Technician Program provided by the CIC. In comparison with the previous year, the retention rate in 2013 fell by 8.8% (CIC, 2015).

Figure 5: Registered Workers with Mandatory Basic Safety Training Course



Source: *Manpower KPIS, M2.2 – Registered Workers with Mandatory Basic Safety Training Course (Green Card)*, CIC, 2016,

2.4 Career development

2.4.1 Caring culture for employees

A generally decreasing trend in industrial accidents indicates that the public sector demonstrated a better performance than the private sector in this area. The working conditions of construction workers are challenging. They have to work at heights or in open or enclosed spaces while being subjected to high temperature and sudden weather changes. They are routinely exposed to dust, noise, and chemicals. Improving the working environment for construction workers and understanding that they are its most valuable asset are essential for the industry. Aside from the hectic working schedule and lack of job security, workers are unmotivated with regard to improving their work quality. Furthermore, certain insurance companies reject the insurance applications of high-risk related specialized trades, such as tower crane operations. Hence, employers face challenges in purchasing high workers' insurance by project, which generally costs HKD100,000 or higher. Insurance premiums for death and work-related injuries remain high, and the choice for workers' insurance is limited. A highly extensive coverage of work-related injury program and income protection insurance package should be provided for workers through group self-insurance schemes. Several stakeholders revealed that most workers who suffered from injuries would return to work after recuperating for a couple of days and would not request compensation because of concerns regarding their job security.

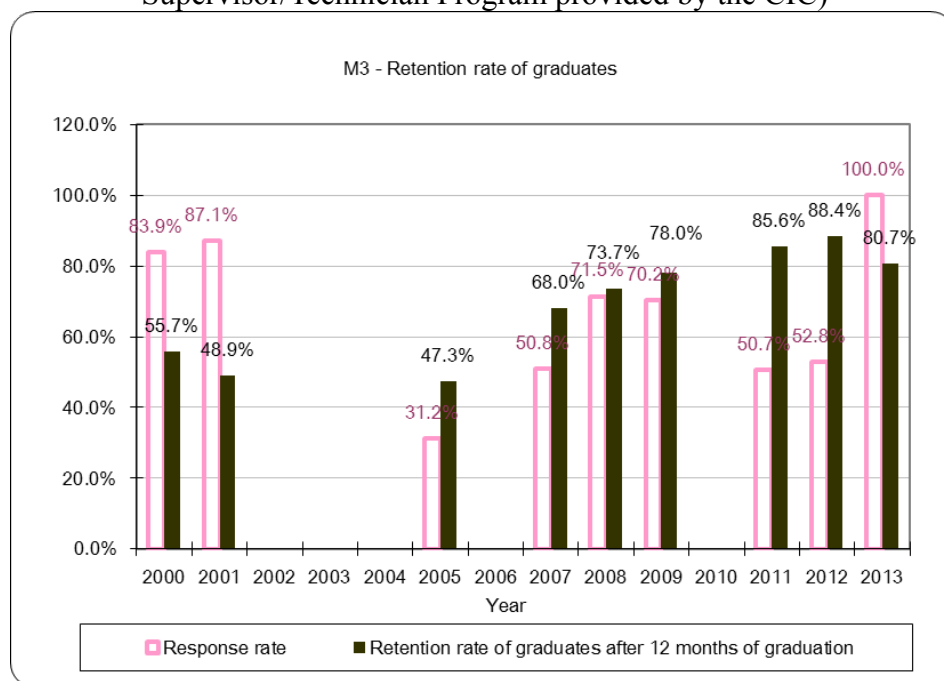
2.4.2 Youth employment support and training programs

Secure and sufficient funding must be available for encouraging youngsters and entrants to join and remain in the construction industry. Many measures by the CIC in the last few years provided high training allowances and placement services to such individuals. With government support, specific training courses, trade testing functions, and employment fairs have been conducted to attract interested youngsters. However, an inconsiderable number of young people are willing to join the industry. In addition, safety and health performance at work must be improved to restore the confidence of entrants and their families. A significantly positive image for the construction industry is essential to attract and support youth employment. Based on the proficiency tests of CIC graduates, the individual productivity of entrants after graduation was 63.2% in the 1st year, 81.2% in the 2nd year, and 100% in the 3rd year. Discounted productivity of in-service skilled workers as trainers required in nurturing entrants in 1st and 2nd years is 25% (CIC, 2014).

The retention rate fluctuated over the past years. The graduates' retention rate had been decreasing since 2000 until 2005. This trend showed a significant improvement between 2007 and 2012. As mentioned, the retention rate in 2013 exhibited a drop of 8.8% compared with the previous year. The retention rate of graduates 12 months after graduation was calculated on the basis of the results of the graduate survey on basic craft courses and the Construction Supervisor/Technician Program provided by the CIC. However, that the graduate statistic should also cover the adult short courses is understood. The retention rate of graduates of short courses after three months of graduation may be provided in the future for further reference. The "response rate" means that the number of

survey forms returned, and the retention rate was calculated on the basis of the returned survey but not on the total number of graduates. “Year” represents the year of graduation of the workers.

Figure 6 Retention Rate of Graduates (Basic Craft courses and Construction Supervisor/Technician Program provided by the CIC)



Source: M3 *Retention Rate of Graduates (Basic craft courses and Construction Supervisor / Technician Programme provided by the CIC)*, CIC, 2014. From http://www.cic.hk/eng/main/research_data_analytics/_industry_report/perform_report_2012/manpower_kpi/.

2.5 Manpower planning and forecasting

2.5.1 Requirements of manpower resource balance in construction

Construction is expected to grow along with the implementation of several major infrastructure projects during the projection period (2016–2023). The major infrastructure projects in recent years involve a total estimated expenditure of over HKD600 billion (Secretary for Development, 2017). Major projects include: Transportation Infrastructure, West Island Line and South Island Line, Sha Tin to Central Link, Tuen Mun Western Bypass and Tuen Mun-Chek Lap Kok Link, Guangzhou–Shenzhen–Hong Kong Express Rail Link, HK–Zhuhai–Macao Bridge, HK–Shenzhen Airport Co-operation, HK–Shenzhen Joint Development of Lok Ma Chau Loop, and Kai Tak Development Plan. Projections indicate that the overall manpower requirements will increase at an average annual rate of 1.9% from 271,100 in 2010 to 315,200 in 2018. Tables 7 and 8 exhibit the overall manpower requirement in the construction industry. Changes in the sectoral composition of employment, along with variations in the mix of works, technology, construction method, procurement, and the demand of the construction industries in neighboring regions, are key drivers of the changing demand for skills in construction (Legislative Council Secretariat, 2015).

Examples of manpower requirements in the industry by different

occupation groups include the following (Table 7): professionals, construction workers, registered skilled/semi-skilled workers, instructors, and workers under instruction (CIC, 2016). Table 9 depicts a list of professional and technical personnel.

Table 7: Projected Manpower Requirements of the Construction Industry
by Occupational Group from 2018 Onward

Human resource need for different occupational groups in construction industry	Projected manpower requirement in 2018 (Number)	Projected average annual % change (2018+)
Managers and administrators	17,200	+3.6
Corporate managers, Government administrators and foreign diplomats	3,000	+3.5
Small business managers	14,190	+3.6
Professionals	12,550	+3.5
Engineering, physical, and mathematical science professionals	11,900	+3.6
Legal, accounting, business and related professionals	520	+3.6
IT / Computer professionals	130	+0.2
Associate professionals	50,560	+2.8
Engineering, physical, and mathematical science associate professionals	40,430	+2.8
Health and life science associate professionals	60	+2.8
Legal, accounting, business and related associate professionals	10,070	+2.8
Clerks	14,390	+2.2
Office clerk	13,970	+2.2
Customer services clerks	250	+2.2
IT assistants	170	0.0
Service workers and shop sales workers	290	+8.0
Personal and protective services workers	240	+8.0
Craft and related workers	161,700	+1.5
Building and extraction trades workers	154,600	+1.5
Metal and machinery trades workers	7,010	+1.5
Other craft and related workers	70	+1.5
Drivers, plant and machine operators, and assemblers	8,760	+1.5
Stationary machine operators and assemblers	290	+1.5
Drivers and mobile machine operators	8,470	+1.5
Elementary occupations	49,740	+1.5
Sales and services elementary occupations, and labourers	49,740	+1.5
Total	315,190	+1.9

Source: *Report on Manpower Projection to 2018*. The Government of the HKSAR, 2012.

Table 8: Projected Overall Manpower Requirement
in the Construction Industry (2016/17–2022/23)

Financial year	Total (Man-year)	
	Lower Bound	Upper Bound
2016 - 2017	207,000	260,000
2017 - 2018	197,000	233,000
2018 - 2019	203,000	242,000
2019 - 2020	193,000	250,000
2020 - 2021	198,000	250,000
2021 - 2022	201,000	247,000
2022 - 2023	189,000	246,000

Source: *Report on Manpower Research for the Construction Industry in Hong Kong*, CIC, 2014.

Table 9: List of Professionals and Technical Personnel

Professional	<ul style="list-style-type: none"> • Architect • Builder / Building Engineer / Construction Manager • Building Surveyor / Maintenance Surveyor / Facility Management Surveyor • Building Services Engineer • Civil Engineer • Construction Plant Engineer • Control and Instrumentation Engineer • Electrical Engineer • Electronics Engineer • Engineering Geologist • Environmental Engineer • Facility Engineer / Operation Engineer / Plant Engineer • Fire Service Engineer • Geotechnical Engineer • Interior Designer • Land Surveyor • Landscape Architect • Lift Engineer • Mechanical Engineer • Permanent Way Engineer • Plumbing and Drainage Engineer • Quality Control / Assurance Engineer • Quantity Surveyor • Refrigeration / Air-Conditioning / Ventilation Engineer • Safety Officer • Structural Engineer • Telecommunication Engineer • Town Planner
Technician	<ul style="list-style-type: none"> • Architectural Technician / Draughtsman • Artist • Assistant Safety Officer / Safety Supervisor • Building Services Technician • Civil / Environmental / Geotechnical / Structural / Engineering Technician • Clerk of Works / Inspector of Works / Works Supervisors • Construction Plant Technician • Construction Materials Purchaser / Storekeeper • Draughtsman • Electrical Engineering Technician • Electrical Instrument and Meter Technician • Electronics Technician

	<ul style="list-style-type: none"> • Estimator • Fire Service Technician • Interior Design Technician • Laboratory Technician (Construction Materials / Soils) • Lift Technician • Mechanical Engineering Technician • Quality Control / Assurance Technician • Refrigeration / Air-conditioning / Ventilation Technician • Site Agent • Site Foreman • Supervisor • Surveying Technician (Building) • Surveying Technician (Facility Management) • Surveying Technician (Land) • Surveying Technician (Quantity) • Surveying Technician (Town Planning) • Technical Officer • Telecommunication Technician
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Source: *Administrative Guidelines on the Applicability of the Registration Requirements for Professional and Technical Personnel*, CIC, 2016.

2.5.2 Forecast for human resource demand

The forecasts for the demand for skilled construction workers (2017–2025) include the following (Table 10): (1) 156 projects added, (2) the incorporated manpower demand estimation of the Three-Runway System (3RS), and (3) hospital projects. The total demand for construction workers in Hong Kong is increasing. Forecast shows that the construction industry would require approximately 258,000 workers in 2016, and this figure is expected to reach roughly 285,000 by 2023, representing an increase of approximately 10.45% in seven years (CIC Manpower Forecasting Model, 2014). The overall demand for construction workers displays an upward trend from 2014 to 2023 (Figures 7 and 8). Demand for construction workers is expected to grow at approximately 2.8% until 2019 and would plateau thereafter (CIC, 2014).

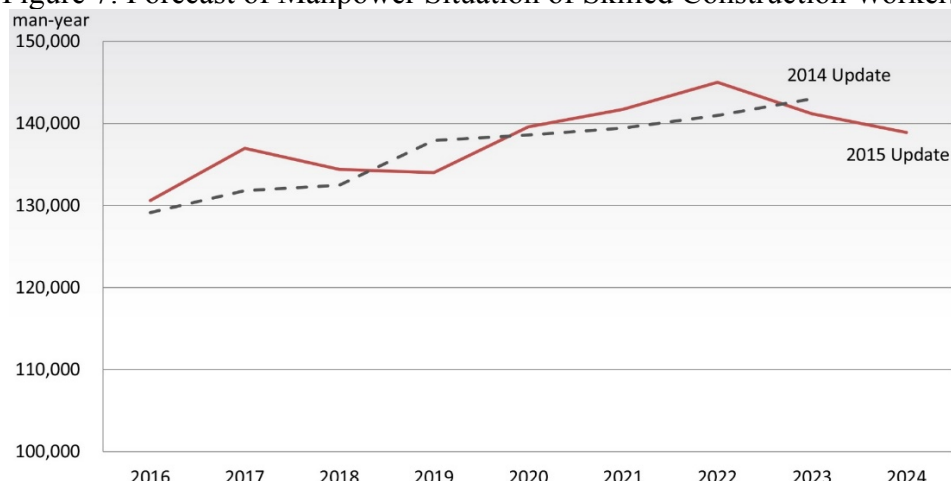
Table 10: Skilled Workers (New Works Oriented) with Demand Larger Than Supply

No.	Trade Classification	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	Bar Bender & Fixer [or Steelbender] *	≤500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Concretor *	≤500	≤500	501-1,000	501-1,000	1,001-1,500	1,501-2,000	1,001-1,500	1,001-1,500	1,501-2,000
3	Drainlayer	501-1,000	501-1,000	1,001-1,500	1,001-1,500	501-1,000	1,001-1,500	1,001-1,500	1,001-1,500	1,001-1,500
6	Scaffolder *	≤500	≤500	501-1,000	≤500	501-1,000	501-1,000	501-1,000	501-1,000	1,001-1,500
7	Carpenter *	1,501-2,000	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000
8	Plant & Equipment Operator (Load Shifting [or Plant Operator (exc. Driver, bulldozer driver, etc.)])	1,001-1,500	501-1,000	N/A	N/A	N/A	501-1,000	N/A	N/A	N/A
9	Metal Worker *	501-1,000	501-1,000	501-1,000	1,001-1,500	1,001-1,500	1,001-1,500	1,501-2,000	1,501-2,000	>2,000
10	Plasterer Terrazzo & Granolithic Worker *	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000
11	Structural Steel Welder *	≤500	≤500	≤500	≤500	≤500	≤500	≤500	≤500	N/A
12	Structural Steel Erector *	≤500	≤500	≤500	≤500	501-1,000	501-1,000	501-1,000	≤500	≤500
13	Rigger/Metal Formwork Erector*	≤500	≤500	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Refrigeration/AC/Ventilation Mechanic *	1,001-1,500	1,001-1,500	1,501-2,000	>2,000	>2,000	>2,000	>2,000	>2,000	>2,000

Source: *Forecast of Manpower Situation of Skilled Construction Workers*, CIC, 2016.

Note: N/A means that no clear projections can be made in those years in several trades. *On the list of shortage trades provided by the Task Force on Short-Term Labor Supply. The above table only reflects the approximate manpower forecast for individual trades and only serves as one of the references in formulating manpower measures.

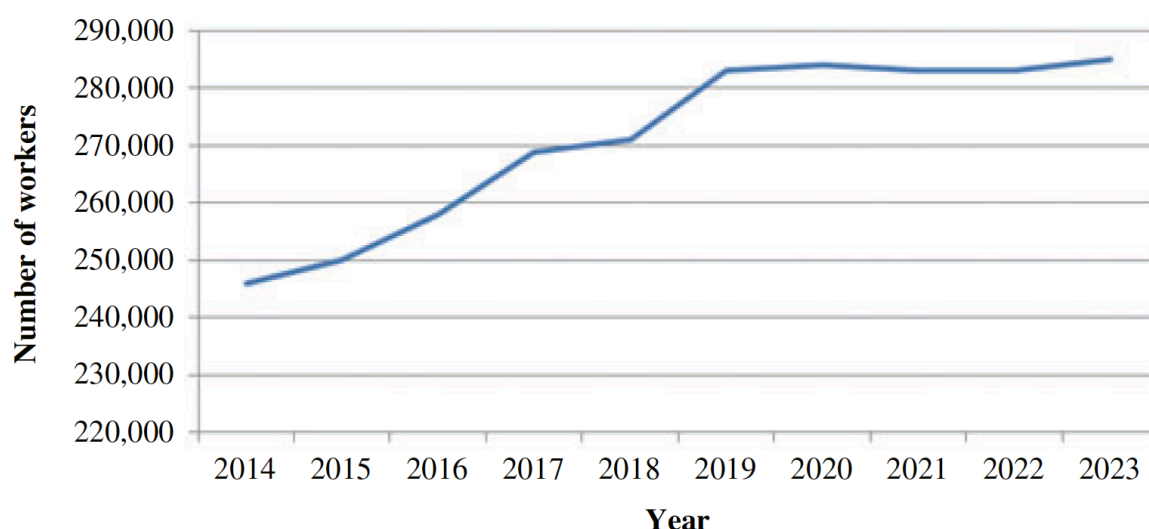
Figure 7: Forecast of Manpower Situation of Skilled Construction Workers



Source: *Forecast of Manpower Situation of Skilled Construction Workers*, CIC, 2016.

Note: The manpower supply figures are in man-year and should be carefully handled when being used for direct comparison with the actual number of workers.

Figure 8: Forecast for Demand for Construction Workers (2014–2023)



Source: *Report of CIC Manpower Forecasting Model 2014 (Workers)*, CIC, 2014.

3. Efforts Made According to the Conditions Surrounding the Construction Industry

3.1 Key determinants of HRD

Demographic factors that generally exert an expansionary effect on manpower supply include a growing population, a rising labor force participation rate, and the younger generation. According to the increasing population growth in Hong Kong, the said growth in the construction industry is expected to be fast in the coming three years (Secretary for Development, 2017). Such an increase is prompted by the large scale infrastructure development and new town

development planned by the government, the real estate development by private developers, and the investments operated by public-private partnership in the near future (a total expenditure of over \$HK600 billion was estimated and planned by the Development Bureau) (Secretary for Development, 2017).

Major concerns exist as regards the shortage of skilled and general workers in the last few years. Entrants are insufficient, particularly for workers, given that the construction industry was traditionally regarded as “grassroots works.” The age profile of existing construction workers revealed that an aging problem is present in the workforce, specifically, 40% of the registered construction workers are 50 years old or above. An aging workforce could mean losing the experienced, older workers that the companies rely on to train new workers. On a positive note, the aging of the population has the potential to reshape not only who works but also how work can be performed. In the last few years, efforts have been expended by the construction associations to attract entrants. However, the industry remains unable to attract a sufficient number of entrants due to the negative image of the industry. Such image involves the following notions: short-term, non-secure, and uncertain workloads, risky job nature in terms of health and safety and site conditions, lack of a formal contract, irregular or late salary payments, temporary workplace, and poor working conditions. A few participants indicated that those who worked in the construction industry did so because they have no choice as they are less-educated. Most of them expressed that they do not want their children to work in the industry.

As indicated earlier, measures have been initiated by the CIC in the last few years by providing high training allowances and placement services to entrants. With the support of the government, specific training courses, trade testing functions, and employment fairs have been conducted to attract interested youngsters into the industry. However, the number of young people who are willing to join the industry is inadequate. They may not consider construction work as their career priority as they feel that the current pay level cannot justify the hard work required. This is a pressing issue as the physical demands for the work are relatively difficult for aging workers. Accordingly, the work safety of such workers should be prioritized. The manpower issue is also interrelated to the accident rate. Even a few major accidents can potentially result in an immediate drop of entrants. Therefore, safety and health performance at work must be improved to restore the confidence of entrants and their families. A significantly positive image for the construction industry is essential as well.

We should also consider how to increase the total stock of talent and professionals. We must examine how to encourage migrant talent to make Hong Kong their permanent home, rather than as a temporary stop to be left after a few years. Surveys conducted among Mainland Chinese and overseas talent living in Hong Kong demonstrated that that housing prices, air quality, and provision of international school places constitute the top three areas that need improvement. Remember that Hong Kong talent is highly adaptable and versatile. Some have moved overseas for employment or education. Many others migrated to the mainland because of its rapid economic development. These movements can be short-term or permanent. The incumbent government has already intensified efforts to connecting with Hong Kong Chinese living or studying overseas or on the mainland. Additional proactive policy efforts should be made, which may

include the following:

- a) Providing additional accommodating immigration arrangements for their families,
- b) Publicizing the opportunities available in Hong Kong and the unique attractiveness of the city,
- c) Providing information about living in Hong Kong, and
- d) Adopting a profoundly welcoming attitude by relaxing the procedure on the recognition of overseas professional qualifications.

3.2 Strategies for addressing labor and skill shortages in Hong Kong's construction industry

3.2.1 Importing foreign skilled workers

Hong Kong is busy with infrastructure development, but its construction industry is facing acute manpower shortage. Currently, the measures undertaken by the government and the industry remain inadequate. A simple yet efficient labor import mechanism is necessary to ensure the timely completion of various projects. Hong Kong has now entered the peak period for infrastructure development. The government shall hasten the following: construction of substantial public housing, urban renewal development, and urban revitalization. Public spending on infrastructure projects in 2015, which amounted to HKD70 billion, has tripled from the said expenditure a decade ago (Legislative Council Secretariat, 2015). Private property development will also expand in the next few years. This forecast, coupled with the large-scale infrastructure works underway, is likely to overload the construction workforce (CGCC, 2016).

To resolve the problem of manpower shortage, particularly in the construction industry, Hong Kong should adapt flexibly to circumstances. Provided that the interests of local workers are well protected, labor may be immediately and suitably imported in targeted and well-defined terms. Otherwise, most projects will fail to progress and meet completion schedules. Any delay in construction projects will not only be detrimental to Hong Kong's overall interests but also adversely affect the local economy, people's livelihood, and social development.

In addressing the issue of inadequate manpower, many countries across the globe have allowed high mobility of working population to enhance economic development and competitiveness. Free trade areas, such as the European Union and the ASEAN, have relaxed their labor mobility mechanisms to boost economic strength. The sustained rapid economic growth of Singapore in recent years is a telling example that attributes its success to a relatively abundant workforce, one-third of which is supplied by additional workers under a well-defined labor import scheme that has been implemented for ten years. By contrast, Hong Kong's policy on labor import is extremely conservative and complacent (BEC, 2013). With the exclusion of foreign domestic helpers, fewer than 2,500 overseas workers are employed in Hong Kong, representing approximately 0.1% of the local workforce (CGCC, 2016).

Contractors may consider training a core number of local workers and meeting the additional labor demand at times of scarcity by importing labor,

rather than by training a large pool of workers who may be at a high risk of unemployment when the market becomes less active. Compared with overseas and mainland talent, foreign workers are far more visible in our community. While the construction industry is facing labor shortages, declining birth rates will also lead to a drop in the supply of the labor force in the years ahead. Youngsters today aspire for high education, substantial quality employment, and enhanced working conditions. Few would like to undertake low-skilled jobs. Imported workers can help provide our community with needed economic and social services. While local workers should enjoy priority in job vacancies, industries (particularly those with a serious manpower shortage) must fill the gap to survive and thrive. As mentioned, labor demand in construction is not long-term in nature and varies periodically. Hence, the importation of labor may provide flexibility to businesses during upswings and can also create a buffer for the local workforce during downturns.

3.2.2 Providing training for entrants for multi-skilled workers

According to the latest report on manpower forecast for construction workers released by CIC in December 2016, the shortage of roughly 10,000 to 15,000 skilled workers will persist in the next few years. Apart from various measures to improve recruitment and training of skilled workers, in April 2014, the government, in collaboration with the industry stakeholders, expedited the preparatory works for Supplementary Labor Scheme (SLS) applications involving 26 trades with manpower shortage as submitted by public works contractors (Development Bureau, 2017). With these enhancement measures, the average processing time for approving the applications has been shortened from 7.5 months to the target of 6 months. As discussed, government-funded training is essential to upgrade the skills of workers. Moreover, the performance of trainees after attending the short training courses remains underdeveloped. Experienced workers should contribute to the training and development scheme as mentors in the training initiatives. In the last few years, numerous measures by the CIC provided high training allowances and placement services to entrants (BEC, 2013). Furthermore, skilled workers will be retrained to become multi-skilled such that the skill transfer process can provide them with additional job opportunities. Additional training courses should be organized through trade associations (see Table 11). The young members of construction and trade associations must be mobilized toward discussing construction sustainability, and their views of future sustainable construction issues must be ascertained.

Table 11: Training Output

Training Output			
Full Time Courses		Calendar Year	
Semi-skilled Workers Training		2015	2016
CIC's In-house Training			
1	Basic Craft Courses	390	378
2	Adult Short Courses	1,118	1,304
3	Enhanced Construction Manpower Training Scheme	2,048	2114
4	Training for Inmates of Correctional Services Department	57	77
	Sub-total	3,613	3,873
Collaborative Training			
5	Contractor Cooperative Training Scheme (CCTS) - Civil and Building Trades	485	522
6	CCTS – Electrical and Mechanical Trades	110	62
7	Subcontractor Cooperative Training Scheme	122	152
8	Plumbing-Contractor Cooperative Training Scheme	10	0
9	Pilot Cooperative Training Scheme with Labor Union	39	12
10	Diploma in Vocational Education Programme Subsidy Scheme - Craftsmen	539	570
	Sub-total	1,305	1,318
	Sub-total for Semi-skilled Workers Training	4,918	5,191
Supervisor / Technician Training			
CIC's In-house Training			
11	Enhanced Construction Supervisor Training Scheme (ECSTS)	116	228
12	Construction Supervisor / Technician (CST) Course	123	146
13	Diploma in Vocational Education Programme Subsidy Scheme - Technician	0	128
	Sub-total for Supervisor / Technician Training	239	502
	Sub-total for Full-time Courses	5,157	5,693
Part Time Courses			
14	Skill Enhancement Courses	2,519	2,058
15	Safety Related Courses	58,528	56,475
16	Technology and Supervision Related Courses	4,753	4,506
17	Trade Test Related Courses	5,948	7,205
18	Specified Training Courses	287	11
19	Commissioned Courses	1,301	1,926
	Sub-total for Part-time Courses	73,336	72,181
	Total No. of Graduates for Full-time & Part-time Courses	78,553	77,874

Source: *Training output*, CIC, 2016.

3.2.3 Adopting new construction technologies and techniques to enhance construction productivity

Information technology (IT) has considerable potential to produce enhanced architectural and engineering designs and achieve highly efficient project management. The CIRC in Hong Kong has recognized IT as an important tool for enhanced information dissemination among all the parties concerned, improved design capabilities, and enhanced project logistics management. Recently, the industry began to benefit from IT particularly through the use of software packages for selected tasks, such as computer-aided design and drafting, building information modeling, structural analysis, budget estimation, and contract administration. Several major clients have played a leading role in promoting the use of IT in information transfer, document management, and project control.

The government has also been taking initiatives to encourage wide adoption of IT and electronic communication in the industry. Such initiatives include the pilot scheme to digitize building plans in the archives of the Buildings Department; the development of an electronic system for building-plan submission

and document management, the use of intranet, site surveillance, and mobile computing in the projects of the Housing Authority to improve information sharing and site supervision; and the use of mobile computing for project delivery and electronic tendering and the implementation of an electronic maintenance management system of the Environment, Transport and Works Bureau. IT is expected to be widely adopted in the construction industry through the three-fold approach recommended by the CIRC, namely, consultation, legalization, and collaboration. All these innovations tend to ease work load but require advanced skills to manage the new technology.

4. Future Development of Human Resource in Construction

4.1 Improving working conditions, including health, safety, and welfare facilities

As discussed, numerous issues are extant regarding the working conditions of construction workers. Thus, contractors are encouraged to provide insurance coverage for their workers and increase the concerns about their job safety. In addition, the modification of the current safety and the environment incentive scheme is required to impose heavy penalties on industrial accidents and poor environmental, health, or safety practices. Certain reports corroborated that the penalty and reward system for either individual or organizational level or their combination with the “The Pay for Safety Scheme” (PFSS)/“Pay for Safety and Environment Scheme” (PFSES) can be developed and encouraged toward promoting the subcontractors’ safety and environmental performance (BEC, 2013). Safety and environmental incentive programs are advised to include cash, prizes, awards, or other forms of recognition to workers for performance. Furthermore, the subcontractors, instead of the main contractors, should receive the reward. Contractors should encourage workers to report safety observations to ensure that incidents are noted. Using the reporting information, management can then begin to address concerns to prevent accidents. The penalty system should be integrated with the construction safety training certification (green card) system, in which points would be deducted when an individual violates the construction safety and environmental protection standards. The enforcement process will require all foremen or several senior individuals to act as safety supervisors.

4.2 Increasing collaboration among industry stakeholders to plan for future manpower requirements

Public organizations, construction-related associations, developers, and the government have crucial roles in promoting the positive image of the industry. Different stakeholders should collaborate and plan for future manpower requirements. For instance, a construction career advancement roadmap can be established, guaranteeing stable income and the prospect of benefits for participants in the training scheme. Stringent industrial safety standards should be enforced to attract youngsters and persuade parents to allow their children to join the construction industry. Additional publicity work could be conducted in a profoundly aggressive way to recruit youngsters in job fairs, secondary schools, and technical colleges. Considerable funding support is advisable to recruit and train a new workforce. For the maintenance of a sustainable workforce, highly

suitable platforms or channels should be established for current and new workers to find jobs for them to be aware of the number of employment opportunities available. Public organizations, developers, and main contractors can organize a project-by-a project referral system to provide employment opportunities for construction workers and construction companies in a medium-to-long-term basis. For foreign workers, sufficient on-site language support is needed to engage those migrant workers who are mainly ethnic minorities.

Manpower is the most valuable asset in the construction industry (CIRC, 2001). Clearly, manpower planning and forecasting is a key foundation to planning human resources and identifying a training strategy. The Enhanced Construction Manpower Training Scheme is offered to satisfy the demand of major infrastructure projects, railway construction, urban renewal, maintenance and building construction, and environmental protection projects. Therefore, examining the existing and potential sustainability issues of the construction sector in Hong Kong is essential to formulate necessary actions for achieving long-term sustainability in the coming decade.

Strategic issues in the construction industry have been recognized as follows (BEC, 2013):

- 1) Fostering a quality culture;
- 2) Achieving value in construction procurement;
- 3) Nurturing a professional workforce;
- 4) Developing an efficient, innovative, and productive industry;
- 5) Improving safety and environmental performance;
- 6) Devising a new institutional framework to drive the industry; and
- 7) Implementing a change program for the industry.

According to the CIC and other industry stakeholders, the local construction industry is facing the problems of an aging workforce and a shortage of young skilled workers (Ho, 2015). In this fact sheet, relevant labor statistics are provided to give an overview of the employment situation as regards the age distribution of registered workers in Hong Kong (Tables 2 and 12). As with many other developed economies, Hong Kong is experiencing the aging of its population. The aging population is expected to influence the age composition of the manpower supply, with notable increases in the number and proportion of workers in the old age groups during the projection period. Specifically, the local manpower supply aged 55 and above is projected to increase significantly at an average annual rate of 5.1% from 452,800 in 2010 to 672,800 in 2018. The proportion of this labor segment to the overall local manpower supply is expected to grow from 13.2% to 18.8%. During the same period, the local manpower supply aged below 55 is expected to shrink from 2.97 million to 2.91 million, with its share of the local manpower supply decreasing from 86.8% to 81.2% (Government of HKSAR, 2012).

Table 12: Age Distribution and Skill Level of Registered Construction Workers

Trade	Age	RGW ¹	Total
Registered Construction Workers	< 20	2,475	2,475
	20 - 24	27,149	27,149
	25 - 29	28,623	28,623
	30 - 34	20,607	20,607
	35 - 39	20,230	20,230
	40 - 44	23,637	23,637
	45 - 49	26,195	26,195
	50 - 54	23,850	23,850
	55 - 59	22,057	22,057
	60 and over 60	26,825	26,825
	Subtotal	221,648	221,648

Source: *Age distribution of registered construction workers and by skill level*, CIC, 2017.

¹RGW: registered general worker.

5. Conclusion

This study provides only an indication of the general discussion of the manpower situation in Hong Kong. Further development of the forecast is necessary to foster long-term strategic development of the construction industry. The said industry is one of the main pillars of the Hong Kong economy. In recent years, numerous issues have emerged locally, including the aging workforce, shortage of skilled labor and entrants, skill mismatch, biased procurement procedures, unequal labor contract, worsening safety issues, and lack of environmental awareness. All these issues result in a poor image of the construction industry as a whole. Therefore, examining the extant issues and the potential solution for human resource development in the Hong Kong construction industry is crucial in formulating necessary actions for achieving long-term sustainable construction in the coming decade.

As mentioned, labor demand in certain industries (e.g., construction) is short-term in nature and varies from time to time. We can consider training a core number of local workers and meeting the additional labor demand during the periods of scarcity by importing labor, rather than training a large pool of workers who may be at a high risk of unemployment during market downturns. If implemented judiciously, the importation of labor provides flexibility to businesses during upswings and can also provide a buffer for the local workforce during downturns. A positive image creates a positive future for the construction industry. The enhancement of the construction industry image in the eyes of the public would be required to counter the perception regarding the 3Ds (i.e., dirty, disorganized, and dangerous). Construction is integral to the economic development of Hong Kong, and construction workers should have matching pride in their roles.

Current efforts seek to achieve a strategic objective: nurturing a professional construction workforce. Support and guidance from the government, public organizations, private developers, construction consultants, main contractors, and construction-related associations are suggested toward

sustainable construction. The following recommendations identified for manpower sustainability (BEC, 2013) should also be considered: (1) promote a positive image of the construction industry in attracting a sustainable workforce, (2) provide long-term employment of construction workers through a project-by-project worker referral system, (3) secure sufficient funding for encouraging youngsters and entrants to join and remain in the industry, (4) develop highly suitable platforms for workers to find jobs, (5) provide additional paid trainings and education for the multi-skill development of construction workers through trade associations, (6) coordinate and offer a comprehensive range of insurance programs to construction companies through trade councils and associations, and (7) nurture employee caring culture to attract and retain construction workers.

Appendices

Table 1: Registration of Construction Workers by Trade Division and Skill Level
(No. of Applications) 30/06/2017

Trade Division No	Trade Division	RGW	RSS	RSS (P)	RSW	RSW (P)	Total
47	Asbestos Abatement Worker				93	0	93
111	Asphalter (Road Construction)		1	0	573	2	576
61	Bamboo Scaffolder		570	0	2,136	13	2,719
99	Bar Bender and Fixer		3,992	0	6,231	108	10,331
27	Bricklayer		2,283	0	1,390	142	3,815
84	Builder's Lift Operator		80		438		518
135	Building Security System Mechanic		214	0	1,128	0	1,342
131A	Cable Jointer (Dead Cable)				3	0	3
131	Cable Jointer (Low Voltage)				470	0	470
130	Cable Jointer (Power)				653	0	653
1	Carpenter (Fender)				36	0	36
5	Carpenter (Formwork - Building Construction)		3,180	1	3,708	213	7,102
6	Carpenter (Formwork - Building Construction) (Striking)				269	0	269
3	Carpenter (Formwork - Civil Construction)		2,324	5	3,458	159	5,946
4	Carpenter (Formwork - Civil Construction) (Striking)				180	0	180
2	Carpenter (Formwork) (Master)		226	0	7,174	0	7,400
23	Cement Sand Mortar Worker (Master)		0	0	11,526	0	11,526
136	Communication System Mechanic		267	0	4,539	0	4,806
50	Concrete and Grouting Worker (Master)				1,575	0	1,575
52	Concrete Repairer (Spalling Concrete)				2,012	13	2,025
51	Concretor		4,853	0	3,741	53	8,647
37	Construction Goods Vehicle Driver (Master)				562		562
138	Construction Plant Mechanic		729	0	1,958	33	2,720
129	Control Panel Assembler		2,211	0	1,424	1	3,636
64	Curtain Wall and Glass Panes Installer (Master)		1	0	2,680	0	2,681

Trade Division No	Trade Division	RGW	RSS	RSS (P)	RSW	RSW (P)	Total
66	Curtain Wall Installer		72	0	1,452	13	1,537
32	Demolition Worker (Building)				658	8	666
31	Demolition Worker (Master)				1,647	0	1,647
33	Demolition Worker (Unauthorized Building Works)				125	2	127
67	Diver (Construction Worker)				257		257
18	Drain and Pipe Layer (Master)				2,127	0	2,127
20	Drainlayer		134	0	1,425	10	1,569
133	Electrical Fitter				43,436		43,436
132	Electrical Wireman		4,665	0	3,998	8	8,671
134	Electronic Equipment Mechanic (Construction Work) (Master)		14	0	1,069	0	1,083
116	Escalator Mechanic				4,243		4,243
46A	False Ceiling Installer		8	0	372	0	380
125	Fire Service Electrical Fitter		572	0	3,264	10	3,846
123	Fire Service Mechanic (Master)				28		28
126	Fire Service Mechanical Fitter		587	0	2,354	9	2,950
124	Fire Service Portable Equipment Fitter				131		131
68	Floor Layer (Master)		0	0	293	0	293
70	Floor Layer (PVC Flooring)		0	0	87	0	87
69	Floor Layer (Timber Flooring)		28	0	93	2	123
127	Gas Installer				2,022		2,022
48	General Welder		4,819	3	14,872	51	19,745
65	Glazier		64	0	750	5	819
73	Ground Investigation Operator/ Driller/ Borer		131	0	698	6	835
54	Grouting Worker				582	1	583
9	Hand-dug Caisson Worker		0	0	11	0	11
7	Joiner		1,747	2	10,675	59	12,483
8	Joiner (Assembling)				678	0	678
10	Leveller		3,073	0	3,878	6	6,957
114	Lift and Escalator Mechanic (Master)				3,643		3,643
115	Lift Mechanic				4,556		4,556
57	Marble Worker (Dry Fixing)		0	0	32	0	32
55	Marble Worker (Master)		127	0	2,069	18	2,214
56	Marble Worker (Polishing)		44	0	298	0	342
58	Marble Worker (Wet Fixing)		3	0	56	0	59
45	Marine Construction Plant Operator (Boom-grab Bucket)		0	0	299	0	299
46	Marine Construction Plant Operator (Boom-hook)		0	0	299	0	299
44	Marine Construction Plant Operator (Derrick)		0	0	409	0	409
43	Marine Construction Plant Operator (Lifting) (Master)		0	0	383	0	383
26	Mason		17	0	83	0	100
139	Mechanical Fitter		791	7	2,628	20	3,446
62	Metal Scaffolder		1,781	4	8,654	39	10,478
35	Metal Worker		1,071	2	10,686	97	11,856
34	Metal-steel Worker (Master)		1	0	3,894	0	3,895
128	Overhead Linesman				497	0	497
104	Painter and Decorator (Brushing Lacquering)				65	0	65

Trade Division No	Trade Division	RGW	RSS	RSS (P)	RSW	RSW (P)	Total
106	Painter and Decorator (Clear Lacquering)				0	0	0
103	Painter and Decorator (Emulsion Painting)				121	0	121
100	Painter and Decorator (Master)		2,769	1	14,201	107	17,078
108	Painter and Decorator (Metal Paint Spray)				73	0	73
109	Painter and Decorator (Paperhanging)				15	0	15
101	Painter and Decorator (Roller Painting)				81	0	81
110	Painter and Decorator (Sign Writing)				2	0	2
102	Painter and Decorator (Surface Filling)				53	0	53
105	Painter and Decorator (Synthetic Painting)				21	0	21
107	Painter and Decorator (Texture-spray)				211	0	211
	Painter (Texture-spray)		10	0			10
62A	Partition (Metal Frame) Installer				137	0	137
22	Paving Block Layer				607	0	607
13	Piling Operative (Bored Pile)		63	0	1,001	2	1,066
11	Piling Operative (Master)		0	0	411	0	411
12	Piling Operative (Percussive Pile)		15	0	250	5	270
21	Pipelayer				505	0	505
137	Plant and Equipment Mechanic (Construction Work) (Master)		1	0	2,979	0	2,980
80	Plant and Equipment Operator (Bored Pile)		49	0	756	5	810
85	Plant and Equipment Operator (Bulldozer)				547		547
94	Plant and Equipment Operator (Compactor)				652		652
90	Plant and Equipment Operator (Crawler-mounted Mobile Crane)				1,833		1,833
82	Plant and Equipment Operator (Demolition) - Excavator				200		200
87	Plant and Equipment Operator (Dumper)				45		45
83	Plant and Equipment Operator (Excavator)				7,362		7,362
74	Plant and Equipment Operator (Fork-lift Truck)				5,063		5,063
93	Plant and Equipment Operator (Gantry Crane)				1,736		1,736
77	Plant and Equipment Operator (Grader)				4		4
88	Plant and Equipment Operator (Loader)				1,236		1,236
92	Plant and Equipment Operator (Locomotive)				48		48
75	Plant and Equipment Operator (Mini -loader)				2,624		2,624
76	Plant and Equipment Operator (Mini-loader (with Attachments))				1,246		1,246

Trade Division No	Trade Division	RGW	RSS	RSS (P)	RSW	RSW (P)	Total
79	Plant and Equipment Operator (Percussive Pile)		1	0	291	3	295
78	Plant and Equipment Operator (Piling) (Master)		0	0	664	0	664
95	Plant and Equipment Operator (Scraper)				0		0
81	Plant and Equipment Operator (Suspended Working Platform)				4,916		4,916
89	Plant and Equipment Operator (Tower Crane)				958		958
86	Plant and Equipment Operator (Truck-mounted Crane)				7,624		7,624
96	Plant and Equipment Operator (Tunneling) - Jumbo Drilling		0	0	110	9	119
	Plant and Equipment Operator (Tunneling) - Locomotive Operation				6		6
97	Plant and Equipment Operator (Tunneling) - Segment Erection		0	0	35	0	35
98	Plant and Equipment Operator (Tunneling) - Tunnel Boring Machine		0	0	48	0	48
91	Plant and Equipment Operator (Wheeled Telescopic Mobile Crane)				1,163		1,163
24	Plasterer		2,182	0	3,758	172	6,112
25	Plasterer (Floor)		9	0	244	0	253
19	Plumber		2,600	0	16,207	74	18,881
63	Prestressing Operative				141	0	141
119	Refrigeration/Air-conditioning/Ventilation Mechanic (Air System)		502	0	2,147	25	2,674
121	Refrigeration/Air-conditioning/Ventilation Mechanic (Electrical Control)		766	0	4,3346	1	44,113
117	Refrigeration/Air-conditioning/Ventilation Mechanic (Master)				9,450	0	9,450
120	Refrigeration/Air-conditioning/Ventilation Mechanic (Thermal Insulation)		35	0	1,571	28	1,634
122	Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System)		896	0	1,271	25	2,192
118	Refrigeration/Air-conditioning/Ventilation Mechanic (Water System)		406	0	1,553	27	1,986
42	Rigger/ Metal Formwork Erector		1,545	0	3,307	34	4,886
113	Rock Breaking Driller				577	19	596
60	Scaffolder (Master)						
53	Shotcretor				187	4	191
112	Shotfirer				48		48
36	Structural Steel Erector		43	0	305	0	348

Trade Division No	Trade Division	RGW	RSS	RSS (P)	RSW	RSW (P)	Total
49	Structural Steel Welder				1,240		1,240
28	Tiler		2,078	1	2,751	142	4,972
29	Tiler (Mosaic)		2	0	67	0	69
30	Tiler (Tile)		6	0	65	0	71
71	Trackworker				514	0	514
41	Truck Driver (Articulated Vehicles)				7,178		7,178
39	Truck Driver (Heavy Goods Vehicles)				14,902		14,902
38	Truck Driver (Medium Goods Vehicles)				24,903		24,903
40	Truck Driver (Special Purpose Vehicles)				2,909		2,909
72	Tunnel Worker				474	5	479
17	Waterproofing Worker (Adhesive-type Felt)				20	0	20
16	Waterproofing Worker (Burn-type Felt)		3	0	13	0	16
15	Waterproofing Worker (Liquid Membrane)				226	0	226
14	Waterproofing Worker (Master)				1,538	8	1,546
59	Window Frame Installer		799	0	2,754	14	3,567
Registered General Worker		221,646					221,646
Total		221,646	55,584	26	401,770	1,810	680,836

Source: *Construction Workers' Registration System (CWRS)*, CIC, 2017.

Notes:

CWRS: construction workers' registration system

RGW: registered general worker,

RSS: registered semi-skilled worker,

RSS(P): registered semi-skilled worker (provisional),

RSW: registered skilled worker,

RSW(P): registered skilled worker (provisional),

N/A: not applicable.

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